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Exploring the Determinants of Service Quality of Cloud E-Learning System for Active System Usage

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Abstract: E-Learning through a cloud-based learning management system, with its various added advantageous features, is a widely used pedagogy at educational institutions in general and more particularly during and post Covid-19 period. Successful adoption and implementation of cloud E-Learning seems difficult without significant service quality. Aims: This study aims to identify the determinant of cloud E-Learning service quality. Methodology: A theoretical model was proposed to gauge the cloud E-Learning service quality by extensive literature search. The most important factors for cloud E-Learning service quality were screened. Instruments for each factor were defined properly, and its content validity was checked with the help of Group Decision Makers (GDMs). Empirical testing was used to validate the proposed theoretical model, the self-structured closed-ended questionnaire was used to conduct an online survey. Findings: Internal consistency of the proposed model was checked with reliability and composite reliability and found appropriate $\alpha \geq 0.70$ and CR ≥ 0.70. Indicator Reliability was matched with the help of Outer Loading and found deemed fit OL ≥ 0.70. To establish Convergent Validity Average Variance Extracted, Factor Loading and Composite Reliability were used and found deemed suitable with AVE ≥ 0.50. The HTMT and Fornell–Lacker tests were applied to assess discriminant validity and found appropriate (HTMT ≤ 0.85). Finally, the Variance Inflation Factor was used to detect multicollinearity if any and found internal and external VIF < 3. Conclusions: Theoretical model for cloud E-Learning service quality was proposed. Information Quality, Reliability, Perceived ease of use and Social Influence were considered as explanatory variables whereas actual system usage was the dependent variable. Empirical testing on all parameters stated that the proposed model was deemed fit in evaluating cloud E-Learning service quality.

Keywords: cloud E-Learning system; cloud E-Learning education; cloud E-Learning services; quality of cloud E-Learning services; active system usage

1. Introduction

Cloud computing is considered as among the most important computer technologies. Many industries are switching to cloud computing for support in IT services; it has grown in popularity and had a significant impact on people's lives [1]. Many companies are turning to cloud computing to help them get through the current economic downturn [2]. Cloud computing can offer a variety of IT services, particularly data centre services, without requiring a significant financial investment in a physical data centre [3,4].

Cloud E-Learning is a paradigm shift in teaching-learning technology that can be used with the help of a digital environment, and it is designed to assist in improving the education system [5]. E-Learning systems are free from the limitations of time and

location and helpful in teaching and learning with new digital form [1]. The availability and popularity of access to the World Wide Web and the presence of different internet tools such as highly configurable computers, laptops, and smartphones help E-Learning in its widespread growth [6]. Students can make their custom-made way to learn with the help of E-Learning. New IT technologies and applications are coming into the market, which also help in the effective implementation of the E-Learning System, and it is reaching the masses [7]. It is noted that the E-Learning system is practised and massively adopted in many developed and developing countries for enhancing comfort in teaching-learning with the help of the Learning Management System (LMS). In the UK, around 95% of higher education institutes are using the support of LMSs during their educational programs [8].

Besides its advantages, complete and effective implementation of E-Learning remains to be accomplished [9]. If E-Learning is effectively applied in educational institutions, we can notice its many potential benefits in teaching and learning. In past studies, many researchers [10,11] studied to identify crucial critical success factors, and they also gave attention to study the success factors for effective E-Learning systems [12]. Some researchers studied direct relationships of different quality factors and usage and satisfaction of the E-Learning system by using the classic technology acceptance models and service quality factors [13–16] to maximize the effectiveness of the E-Learning system.

Service quality is used to measure the quality of different management practices and culture for the benefit of the customers of the organization. Various evaluation techniques, web tools or user expectation appraisal models are also available to check the quality of web-based services such as online selling and purchasing and delivery of different items, as well as web-based communication [17]. All attentive service providers give importance to service quality and listen gently to their users' feedback so that they can achieve more satisfaction and loyalty from them by enhancing the quality of their services as per the wish of their users [18].

Different studies have focused on the E-Learning service quality factors, for example, Uppal A. M. et al. (2018) [19] focused on issues of E-Learning quality (ELQ) of service in higher education environments. They proposed an extended SERVQUAL model, the ELQ model, which in addition to crucial service constructs, facilitates consideration of both information and system quality factors. Their proposed model comprises of three dimensions; (1) the Service dimension, consisting of five independent variables; "Responsiveness," "Reliability," "Tangibility," "Assurance" and "Empathy," (2) the Information dimension, comprising of "Learning Content" and (3) the System dimension, comprising of "Course Website." They propose that in addition to "service," consideration of "information" and "system" quality are vital to achieving the overall perception of quality for E-Learning systems.

Haryaka et al. (2017) [20] critically analyzed the Technology Acceptance Model (TAM), the Information System Success Model (IS Model) and the User eLearning Satisfaction Model. The study evaluated user acceptance and satisfaction for E-Learning, service quality, information quality, user participation, and benefit.

Kimiloglu et al. (2017) [21] conducted an exploratory study with the aims to examine the attitudes of usage of E-Learning for corporate training. The study critically examined the IS success model of DeLone and McLean [22], the E-Learning system success model (ELSS) of Wang, Wang and Shee (2007) [23], the Technology Acceptance Model (TAM) of Davis (2000) [24] and the extended TAM model of Lee, Hsieh and Chen (2013) [25]. The study constructed its model by highlighting the advantages and disadvantages of E-Learning from a literature search.

The factors that may have a substantial effect on the service quality of Cloud E-Learning were investigated in this regard. A modified model is prepared by incorporating factors from SERVQUAL and technology acceptance theories such as DeLone and McLean, TAM and UTAUT.

The objectives of the present research are as follows:

- To check the impact of reliability on actual system usage.

- To assess the influence of information quality on actual system usage.
- To identify the consequence of social influence on actual system usage.
- To inspect the effect of perceived ease of use on actual system usage.

Thus, the present research aims to study the service quality factors that affect students' acceptance of the Cloud E-Learning system at the Saudi Arabian university. Four research hypotheses encompassing the multifold objectives are formulated and tested using a questionnaire survey. This proposed model is tested empirically through survey data gathered from 474 students at the Saudi Arabian universities.

The present research study has been organized as follows: Section 2 discusses E-Learning service quality and the technology acceptance theories to propose a research model. It also articulates the hypothesis backed by rigorous literature review classified in different subsections. Section 3 discusses the adopted research methodology. In Section 4, the collected survey data is analyzed, and relevant findings are discussed, along with subsequent results. Discussion and recommendations are provided in Sections 5 and 6, respectively. The last section provides the conclusion of the present study.

2. Theoretical Foundation of Framework

E-Learning has increased steadily with several new technologies and ICT tools, such as computers, laptops, and highly configurable smartphones and tablets for teaching and learning services. A new technology created new opportunities for the education system. Earlier, physical presence was needed for receiving learning material; today, all types (audio, video, text etc.) of learning material are readily available due to the internet-based E-Learning system for self-paced learning [8]. Researchers defined E-Learning systems as "an information system that can integrate a wide variety of instructional material (via audio, video, and text mediums) conveyed through e-mail, live chat sessions, online discussions, forums, quizzes, and assignments" [25]. In the present study, E-Learning is considered as an Information System (IS), and its success is regarded as an IS success.

Widespread literature has been reviewed to understand the current trends, theories, and models of IS technology acceptance and important factors for university level usage of E-Learning. Different researchers have used different factors from different models to measure the service quality of E-Learning. Some researchers applied SERVQUAL [26,27], Unified Theory of Acceptance and Use of Technology (UTAUT) [21], Technology Acceptance Model (TAM) [8,20,28] and DeLone and McLean [6,15,29]. The details of the different models used by different researchers are given in Appendix B.

After an extensive literature review, we found that further research is needed to find the actual use of E-Learning systems by Saudi university students; as well, it is also essential to know the critical factors from different models which were frequently used in various studies. These factors were examined, analyzed, and further assessed. Initially, sixteen items are selected for further discussion with decision-makers (DMs), who are expert practitioners in E-Learning teaching-learning systems. A single decision-maker (DM) may give a prejudiced personal view, which may result in an inaccurate decision. To eradicate prejudices in decision-making, the final factors were selected with the help of three DMs who know and use E-Learning systems.

The final factors were selected by the two-stage process, initially through systematic literature review. Secondly, thorough expert opinions were taken from expert decision-makers. Different perceptions such as service quality, information quality, peers' influence and system usage comfortability were also carefully considered for evaluating the success of the E-Learning system. A Nominal group technique (NGT) was adopted to combine SERVQUAL and other models such as DeLone and McLean, UTAUT and TAM to propose an E-Learning SQ Model (E-LSQM) by assimilating five constructs, as shown in Figure 1. The proposed model plays a vital role in exploring the effect of E-Learning service quality. The proposed model comprises of four independent variables/factors (IVs) and one dependent variable/factor (DV). Reliability is derived from SERVQUAL, and Information

Quality is taken from DeLone and McLean, Social Influence is derived from UTAUT, and Perceived Ease of Use and Actual System Usage are taken from TAM.
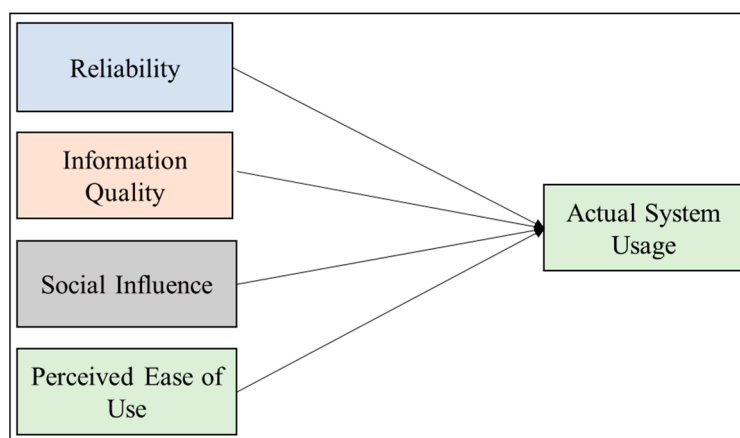
Figure 1. Cloud E-Learning SQ Model (E-LSQM).

Figure 1 depicts the E-Learning SQ Model (E-LSQM). The following sub-sections further explain the selected constructs.

2.1. Reliability

SERVQUAL [30] is a widely used customer-driven instrument for research. It is used to know the preferences and expectations of the services received by the customer. Many researchers used this scale in different industries, from retail to hospitality and consulting. It is using in assessing the service delivery of E-Learning quality as well [31]. It has five different dimensions which are assumed to reflect the quality of service. Reliability is one of the essential dimensions of SERVQUAL.

Reliability is the capacity to carry out the promised operation consistently and reliably [31]. It is the ability to survey the services offered with reliability and accuracy. It is one of the five dimensions presented in the SERVQUAL model survey of quality models of e-learning systems [32]. Reliability is good working efficiency of the overall structure and function of the E-Learning system or website and dealing with the technical issues of the interface of the E-Learning users; it also includes accuracy of the system as well as providing all the services as promised by the system [17]. An increase in Reliability will motivate the user to use the system. Based on these research studies, it is observed the E-Learning system Reliability will increase satisfaction and influence to increase its usage among the university students. Thus, the following hypothesis is proposed:

Hypothesis 1 (H1). *Reliability of the system influences the actual system usage.*

2.2. Information Quality

Information quality is a crucial and essential element in assessing the information performance of Cloud E-Learning systems. It plays a vital role in knowledge delivery and achieving teaching and learning goals [19]. Serious problems can arise due to inadequate information quality of the E-Learning System [33]. The Delone and Maclean model considered Information quality as a very crucial dimension of the success of information systems [22]. Good Information quality of the E-Learning System can increase the satisfaction of the user and rise to the usage of the system by the students [34]. So, it is considered that good information quality will motivate the user and increase the use of the actual system and proposed the following hypothesis:

Hypothesis 2 (H2). *Information Quality of the system affects the actual system usage.*

2.3. Social Influence

Social Influence is an essential dimension of the UTAUT model. It is a person's consideration of other peers' opinions about using the new technology or system. Social influence is a huge boost in a person's use of the latest technology or system as it is affected by people's motivation and the circumstance around them [35]. Nikolić (2018) [32] also studied different E-Learning factors and including Social Influence for making the E-Learning satisfaction model for the E-Learning users. Nikolić (2018) [32] analyzed and reviewed a comprehensive E-Learning model for developing countries and found social support and influence is suitable for Cloud E-Learning users. Thus, the following hypotheses concern to Social Influence is proposed:

Hypothesis 3 (H3). *Social Influence impacts the actual system usage.*

2.4. Perceived Ease of Use

Perceived Ease of Use positively affects and enhances students' intentions to use the services provided by the Cloud E-Learning System. Different studies suggested that Perceived Ease of Use is the main determining factor that positively affects the intention to use the existing system [28]. Everyone loves joy, happiness, fun, gratification and liveliness in their work, and the presence of these factors motivates their usage and acceptance of the online web-based system [28]. The study of Lee et al., [36] also suggests that perceived playfulness or ease of use significantly influenced the usage of the internet-based learning system [37]. Thus, this study hypothesized the following:

Hypothesis 4 (H4). *Perceived Ease of Use of the system impacts the actual system usage.*

2.5. Actual System Usage

Usage of the actual system is an essential measure in different models such as TAM [24] and Delone and McLean [22]. Good reliability through system quality, proper information contents quality can affect users' frequency to use the system. Increased features and facilities of the system also increase motivation and satisfaction in the use of the actual system [20].

3. Research Methodology

This section deals with the various aspects of the research design used in the present study and how they are documented. It helps the researcher to understand the research study, ways and means of data gathering and subsequent analysis to accomplish the research objectives [38]. The research began by exploring the requisite knowledge, objectives, and a hypothesis from the framework [39]. The present study uses a quantitative method for construct testing in the conceptual model. The approach uses top-down deductive, imbibing framework formation and hypothesis development.

The primary data is collected through a questionnaire survey administered among the identified respondents as given in Appendix A. The questionnaire survey has both multiple-choice answers in the demographics section and a closed-ended question which has the 5-point Likert scale. The questionnaire survey is developed in 3 different sections. In Section 1, the researcher introduces himself and the objective of the study. Section 2 consists of a respondent's profile demographic items and a survey based on constructs related to the service quality of E-Learning is discussed in Section 3. The validity of this instrument was tested by published research studies and backed by six E-Learning expert peers. The expert group has E-Learning experience of more than five years and the experts belong to different universities. The expert group was selected voluntarily from engineering, medicine, computer science, science and humanities and social science disciplines.

The pilot study is used for finding errors and ambiguity in the questionnaire [40]. It measures the instrument by conducting content reliability. The reliability is carried out based on the pilot study data obtained from 30 randomly selected respondents from the

engineering, science, and computer science faculty. Later, these respondents were excluded from the actual data survey. An instrument consisting of several items must be subjected to a consistency check, which is usually accomplished using the Cronbach coefficient (α) [41]. The questionnaire items or statements have a coefficient measure varying from 0 to 1 unit. The use of the Cronbach coefficient as a tool to measure the reliability of an instrument is undisputable.

Upon establishing an acceptable level of reliability in the pilot study, the researchers collected data confidently using the instrument developed for this study. Data were gathered from Saudi Arabian universities. In total, 497 responses were received from the respondents. However, 27 responses were rejected due to incomplete information; later, these 27 responses were removed from the analyses. Thus, in total, 474 valid responses were identified for subsequent data analysis. For the present study, a non-probability and convenience sampling design was used.

4. Analysis and Findings

The data were analyzed with the use of structural equation modelling for the proposed conceptual model of service quality of E-Learning. The proposed model is designed and presented in Figure 2 with the use of SmartPLS (v. 3.3.2).
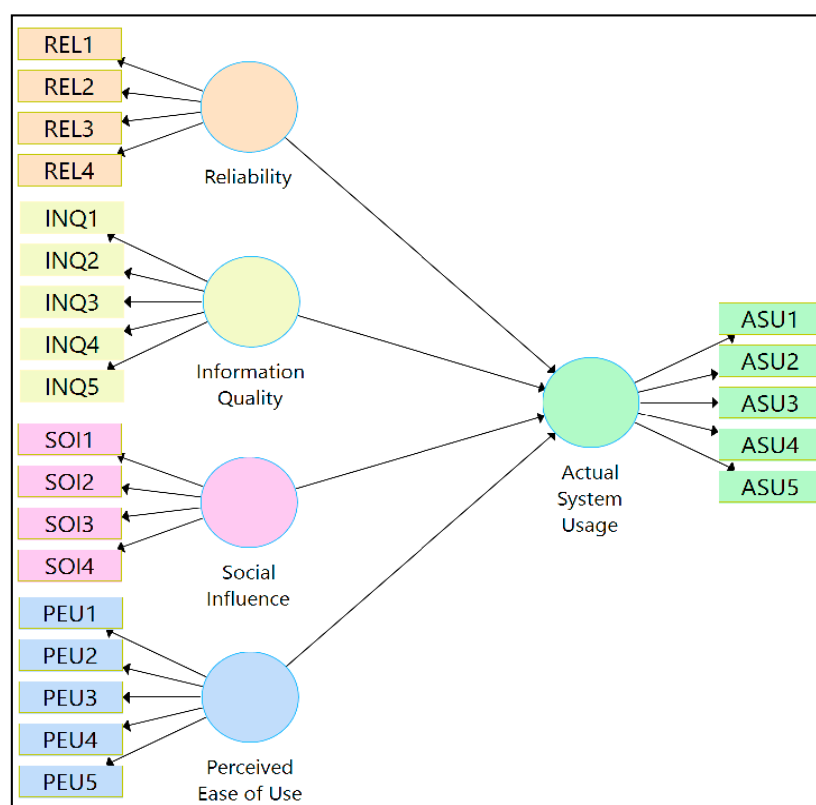

Figure 2. Conceptual model for E-Learning Service Quality.

The results of the demographic section of the participants are described in Table 1. The results of the demographic profile state that more than half (62.4%) of respondents are female. The highest percentage (37.1%) of participants belong to the age group of 21–28 years, whereas the lowest percentage of (15.2%) respondents belong to the age group of above 25 years. In terms of the E-Learning experience, more than half (56.1%) of therespondents used E-Learning services for less than one year while approximately five per cent (5.3%) respondents used E-Learning services for more than five years. Types of E-Learning are explained in five categories depending on the weightage of E-Learning and traditional learning. Basics is the first among five, which has only 10% of the weightage of

assessment for course design or description, assessment criteria, contact hours, discussion, announcements, and forum. Blended-1 is a mixture of 30% online teaching and 70% face-to-face classroom teaching whereas blended-2 is a mixture of 50% online teaching and 50% face-to-face teaching in the classroom. Blended-3 is a mixture of 70% online teaching and 30% face-to-face teaching in the classroom whereas full E-Learning includes 100% online teaching. Under types of E-Learning users, a maximum (35%) number of respondents belong to blended-1 courses followed by those (28.3%) from basics courses, (27%) full E-Learning courses, (5.3%) blended-3 courses and (4.4%) blended-2 courses. The area of study is explained in three categories as Medical and Health Science which includes medicine, dentistry, pharmacy, nursing, physical therapy, laboratory science, radiology science and health administration. Engineering and Computer Science includes all branches of engineering, computer science and information systems. Humanities and Social Sciences includes language and translation, Islamic studies, and studies from the college of business administration. Most of the respondents (43.2%) belong to Engineering and Computer Science followed by (30.2%) those from Medical and Health Science whereas the lowest (26.6%) number of respondents belong to Humanities and Social Sciences. In terms of E-Learning usage, 38.6% of respondents spent 1–2 h daily for E-Learning, 22.6% spent 3–4 h, 21.9% spent more than 4 h and 16.9% spent less than one hour.

Table 1. Demographic profile of respondents.

		n	*%*
Gender	Male	178	37.6
	Female	296	62.4
Age (in Years)	Under 18	84	17.7
	18–21	176	37.1
	22–25	142	30.0
	Above 25	72	15.2
E-Learning Experience (in Years)	Less than 1	266	56.1
	1–2	129	27.2
	3–5	54	11.4
	More than 5	25	5.3
Types of E-Learning System	Basics	134	28.3
	Blended-1	166	35.0
	Blended-2	21	4.4
	Blended-3	25	5.3
	Full E-Learning	128	27.0
Area of Study	Medical and Health Science	143	30.2
	Engineering and Computer Science	205	43.2
	Humanities and Social Sciences	126	26.6
Daily use of E-Learning (in hours)	Less than 1	80	16.9
	1–2	183	38.6
	3–4	107	22.6
	More than 4	104	21.9

To check the reliability of the proposed model Cronbach's alpha was used. Composite reliability was applied to measure internal consistency, while indicator reliability was tested using outer loadings. To ensure validity, average variance extraction and the Heterotrait–Monotrait relationship were used. Several studies suggested to [36] retain the indicators if the outer loading (OL) exceeds 0.70. The relationship needs to be investigated using average variance extracted and composite reliability if the outer loading ranges from 0.40 to 0.70. If AVE and CR meet the inclusion criteria, the indicators are kept; otherwise, they are excluded from further consideration.

Apart from one factor of actual system use (ASU1-0.691), factor loading is greater than 0.70 in Table 2. However, the CR (0.925) and AVE (0.712) are higher than the required

level for retaining any construct item. Finally, in a proposed model for E-Learning service efficiency, all constructs were kept in their initial state. To evaluate the validity of the model Cronbach's alpha was calculated and to examine internal consistency composite reliability and average variance were calculated and depicted in Table 2. Composite reliability and Cronbach's alpha were greater than 0.70, indicating that they met the minimum [42] criterion for further investigation. For the proposed E-Learning service quality model, all constructs were found to be valid. Average variance extracted for all constructs was greater than 0.50 and met the standard inclusion criteria [43]. Therefore, all five constructs were considered as deemed suitable for assessing E-Learning service quality.

Table 2. Factor analysis (OU), reliability (α), composite reliability (CR) and average variance extracted (AVE).

Constructs	Items	Outer Loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
		OL $\geq$ 0.70	$\alpha \geq$ 0.70	CR $\geq$ 0.70	AVE $\geq$ 0.50
Actual System Usage	ASU1	0.691			
	ASU2	0.857			
	ASU3	0.876	0.896	0.925	0.712
	ASU4	0.801			
	ASU5	0.807			
Information Quality	INQ1	0.744			
	INQ2	0.810			
	INQ3	0.805	0.867	0.903	0.651
	INQ4	0.820			
	INQ5	0.809			
Perceived Ease of Use	PEU1	0.817			
	PEU2	0.834			
	PEU3	0.827	0.929	0.946	0.779
	PEU4	0.810			
	PEU5	0.864			
Reliability	REL1	0.822			
	REL2	0.842			
	REL3	0.824	0.877	0.916	0.734
	REL4	0.781			
Social Influence	SOI1	0.839			
	SOI2	0.836			
	SOI3	0.838	0.861	0.905	0.705
	SOI4	0.834			

The result of the Fornell–Larcker criteria illustrates that the value in the diagonal is higher as compared to the other values of the same constructs, as shown in Table 3. Heterotrait–Monotrait (HTMT) analysis was used to evaluate discriminant validity, as suggested by [44]. The association between the same construct in a different time frame is known as HTMT correlation.

Table 3. Farnell–Larcker Criterion.

	Actual System Usage	Information Quality	Perceived Ease of Use	Reliability	Social Influence
Actual System Usage	0.824	-	-	-	-
Information Quality	0.692	0.807	-	-	-
Perceived Ease of Use	0.731	0.678	0.823	-	-
Reliability	0.637	0.640	0.493	0.826	-
Social Influence	0.749	0.726	0.816	0.548	0.819

Table 4 states that the value of correlation with the same constructs under acceptable range (HTMT < 0.85). Finally, the outcome of the Fornell–Larcker Criterion and Heterotrait–Monotrait Ratio is evident enough for the proposed model in measuring E-Learning Service Quality.

Table 4. Heterotrait–Monotrait Ratio.

	Actual System Usage	Information Quality	Perceived Ease of Use	Reliability	Social Influence
Actual System Usage	-	-	-	-	-
Information Quality	0.766	-	-	-	-
Perceived Ease of Use	0.714	0.732	-	-	-
Reliability	0.708	0.731	0.543	-	-
Social Influence	0.734	0.605	0.708	0.630	-

Hair et al. state: "A common threshold is a VIF value above 10 initially". Just after a few years, R. B. Kline [45] proposed a VIF value of 5 as the threshold in the context of covariance-based SEM. Finally, R. T. Cenfetelli and G. Bassellier [39] recommended 3.3 as the VIF threshold in the context of variance-based SEM but in discussions of formative latent variable measurement [45]. By considering all aspects this study considered the VIF threshold as 3.3, where the indicators are predictors of the latent variable score.

As depicted in Table 5, VIF is less than 3 for all independent constructs and their instruments. It is evident from VIF results that no multicollinearity exists.

Table 5. Variance Inflation Factor (VIF).

Actual System Usage	ASU1	1.405	1.537
	ASU2	2.408	
	ASU3	1.174	
	ASU4	1.342	
	ASU5	2.232	
Information Quality	INQ1	1.809	2.670
	INQ2	1.483	
	INQ3	2.933	
	INQ4	2.249	
	INQ5	2.207	
Perceived Ease of Use	PEU1	2.660	2.135
	PEU2	1.384	
	PEU3	2.391	
	PEU4	1.817	
	PEU5	2.867	
Reliability	REL1	2.035	1.739
	REL2	2.265	
	REL3	2.026	
	REL4	1.699	
Social Influence	SOI1	1.982	2.632
	SOI2	2.187	
	SOI3	1.963	
	SOI4	2.015	

The Structural Path Coefficients (β values) were calculated using SmartPLS (v. 3.3.2) and are depicted in Figures 2–4; the figures show the path coefficient diagram. T-tests with their significance level were determined and presented in Table 6 to measure the significant level of path coefficients (β values). As shown in Figure 2, the four constructs, namely Reliability, Information Quality, Social Influence, and Perceived Ease of Use, explained 67.4 per cent of actual device use.
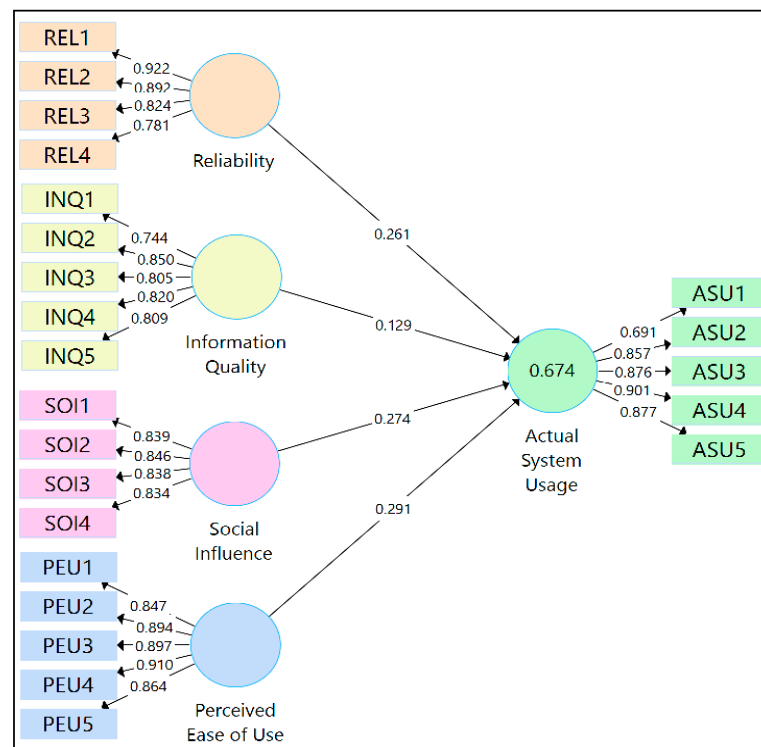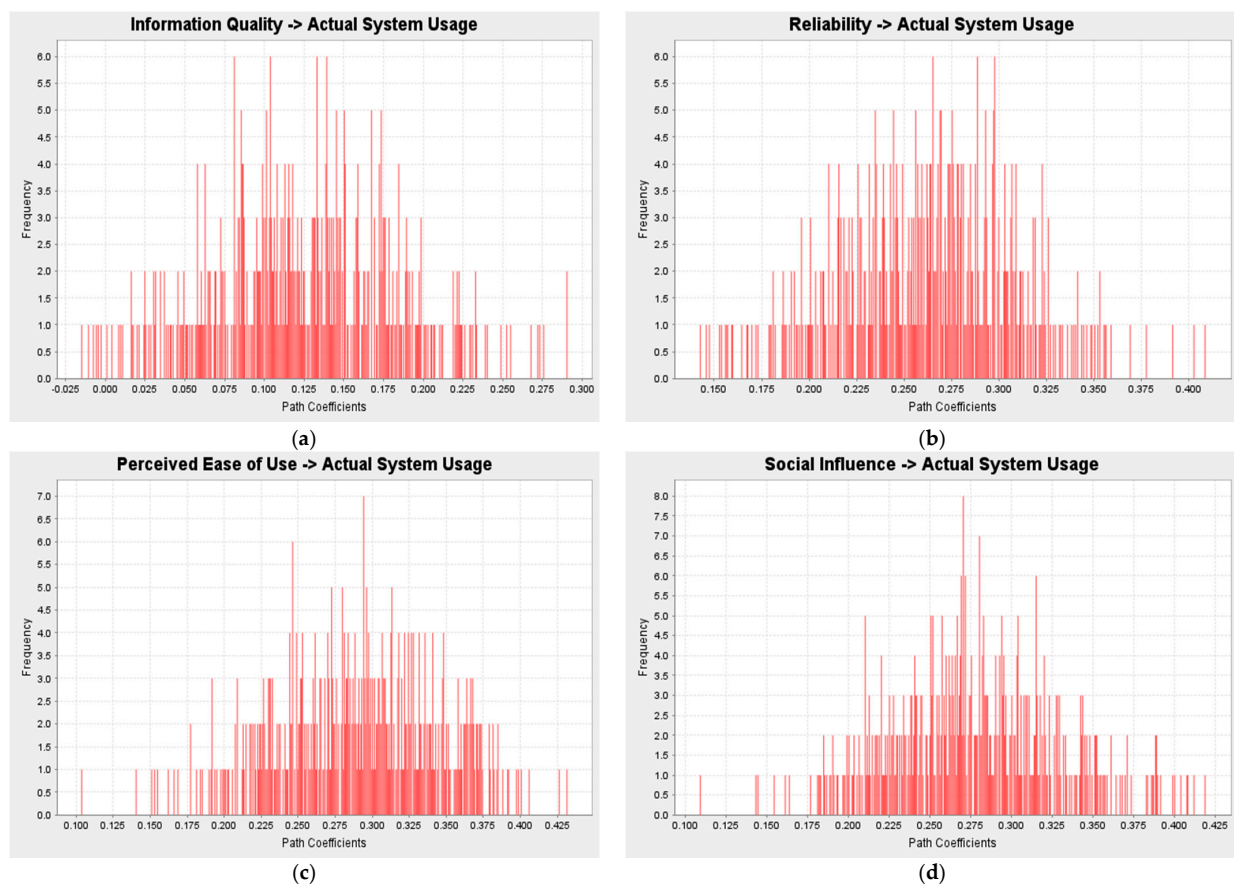
Figure 3. Structural Path Model Coefficient.

Figure 4. Path Coefficient Diagram; (**a**) Information Quality to Actual System Usage; (**b**) Reliability to Actual System Usage; (**c**) Perceived Ease of Use to Actual System Usage; and (**d**) Social influence to Actual System Usage.

Table 6. T-Test with a Significance Level.

Hypo.	Path	β Value	*T* Statistics	*p* Values	Decision
H1	Information Quality–Actual System Usage	0.129	2.353	0.019	Accept
H2	Perceived Ease of use–Actual System Usage	0.291	5.925	<0.001	Accept
H3	Reliability–Actual System Usage	0.261	6.162	<0.001	Accept
H4	Social Influence–Actual System Usage	0.274	5.312	<0.001	Accept

Among the four independent constructs, perceived ease of use contributes the maximum (29.1%) in actual system usage, followed by (27.4%) social influence, (26.1%) reliability and the least (12.9%) information quality in determining the actual system usage of E-Learning.

The result of path coefficients (β values), t-test indicators and *p* values are shown in Table 6, which demonstrates that the association between information quality and actual system usage is significant ($p < 0.05$) with a 95% confidence level. A significant association was observed between actual system usage and perceived ease of use ($p < 0.05$). The correlation between social influence and reliability was significant ($p < 0.05$) with a 95% confidence level. The significant level of all four constructs was confirmed with a greater t value ($T > 1.650$). Finally, results indicate that all four independent constructs found significant in determining the actual system usage of E-Learning.

5. Discussion

The study's findings back up Hypothesis H1, indicating that Actual System Usage and Information Quality are directly and significantly related. Moreover, Actual System Usage highly depends on the five identified instruments of Information Quality such as I use the E-Learning System in an enjoyable way to improve my studies, I use the E-Learning System for storing and sharing course-related documents, I recommend the E-Learning System for others use, I use the E-Learning System in my studies, and the E-Learning System has helped me to achieve my learning goals.

Hypothesis H2 is supported and accepted. In other words, Perceived Ease of Use and Actual System Usage are positively and significantly associated with each other, which clearly states that higher the perceived ease of use leads to greater Actual System Usage. Perceived Ease of Use is explained by four instruments such as the E-Learning System is easy to use, the knowledge from the E-Learning System is easy to understand, the E-Learning system has ease in distributing data and information and the E-Learning system has ease of communication with other friends and Instructors. Other researchers [28,46–48] studied the effect of perceived ease of use on Actual System Usage which shows the current finding is like the previous findings.

Hypothesis H3 is not rejected, stating that there is a highly positive association between reliability and actual system use. The instruments of reliability like the E-Learning system runs in a correct reliable way, the E-Learning system is reliable for providing correct information when needed, the Instructors of the E-Learning system are dependable for the appropriate course contents, and the E-Learning support unit is ready to help whenever I need support with the system, having a strong influence on the Actual System Usage. The higher value of the reliability of learners influences them towards Actual System Usage. Several researchers [8,19,32] also studied the effect of the user's reliability on Actual System Usage, which shows the current findings confirm the previous findings.

Hypothesis H4 was supported, which states that Social Influence is highly positive, and significantly associated with the Actual System Usage. The items of Social Influence like students who influence me to think that I should use the E-Learning system, friends who are essential to me think that usage of my E-Learning system will increase my grades, and Instructors who are helping during the usage of the system. E-learning deanship will give full support with training that has a more significant positive impact on the Actual

System Usage. Previous studies [15,22] examined the Social Influence's effect on the Actual System Usage, and their finding is as the result of the current study.

Previous research has looked into Actual System Use [15,20,32,48,49] and found that Information Quality, Perceived Ease of Use, Reliability, and Social Influence are among the most important constructs and explanatory variables for Actual System Use, among others. The current study concludes that four factors, namely, Information Quality, Perceived Ease of Use, Reliability, and Social Influence, have the greatest impact on Actual System Use.

6. Conclusions

Initially, the determinant of E-Learning service quality was established with the use of an extensive literature review. The four most influencing factors (Information Quality, Perceived ease of use, Reliability and Social Influence) for E-Learning service were extracted from existing literature. Reliability derived from SERVQUAL, Information Quality derived from DeLone and McLean, Social Influence derived from UTAUT, Perceived Ease of Use and Actual System Usage derived from the TAM model. The proposed theoretical model was tested empirically for its academic sustenance. Outer loading of each instrument was calculated and found suitable for inclusion in the proposed model (OL $\geq$ 0.70). The Cronbach Alpha of each construct was calculated to check its reliability and found appropriate ($\alpha \geq$ 0.70). To check the internal consistency of scale items, composite reliability was calculated and found deemed fit (CR $\geq$ 0.70). To test the validity of the proposed model, the Average Variance Extracted was calculated and found deemed valid for inclusion (AVE $\geq$ 0.50). The Discriminant validity was performed to check the degree of difference between overlapping constructs. The Fornell–Lacker criterion was used to compare the square root of the average variance extracted with the correlation of latent constructs and found appropriate. The Heterotrait–Monotrait ratio of correlation was applied to check the lack of discriminant validity with a threshold value of 0.85. To detect the multicollinearity, the Variance Inflation Factor was used and found no multicollinearity existed, as each construct and their instruments had their VIF < 3. Finally, all four parameters of empirical testing, namely Internal Consistency, Indicator Reliability, Convergent Validity and Discriminant Validity were checked and found appropriate to assess E-Learning acceptance. A future study might be conducted with a larger data set and inclusion of extraneous variables to further enhance the coefficient of model explanation which is presently 0.674.

Appendix A

Table A1. Construct Measurements and Sources.

Construct	Item	Measure	Source
Reliability	REL1	The Cloud E-Learning System runs in a reliably right away.	[8]
	REL2	The Cloud E-Learning System is reliable for providing correct information when needed.	[6]
	REL3	The Instructors of the Cloud E-Learning System are dependable for the appropriate course contents.	[8]
	REL4	The Cloud E-Learning support unit is ready to help whenever I need support with the system.	[6]
Information Quality	INQ1	The Cloud E-Learning System uses audio elements properly.	[31]
	INQ2	The Cloud E-Learning System offers accurate, up-to-date information.	[19,43]
	INQ3	The Cloud E-Learning System provides complete relevant and useful information.	[19,28]
	INQ4	The Cloud E-Learning System gives course information in easy to understand language.	[31]
	INQ5	The Cloud E-Learning System provides teaching materials that fit with the course learning objectives.	[28]
Social Influence	SOI1	Students who influence me think that I should use Cloud E-Learning System.	[32]
	SOI2	Friends who are important to me think that usage of my Cloud E-Learning system will increase my grades.	[32]
	SOI3	Instructors help during the usage of the system.	[32]
	SOI4	E-Learning Deanship will give full support with training.	[32]
Perceived Ease of Use	PEU1	The Cloud E-Learning System is easy to use.	[28]
	PEU2	The knowledge from the Cloud E-Learning system is easy to understand.	[28]
	PEU3	The Cloud E-Learning system has ease in distributing data and information.	[8]
	PEU4	The Cloud E-Learning system has ease of communication with other friends and Instructors.	[8]
Actual System Usage	ASU1	I use the the Cloud E-Learning System in an enjoyable way to improve my studies.	[31]
	ASU2	I use the Cloud E-Learning System for storing and sharing course-related documents.	[31]
	ASU3	I recommend the Cloud E-Learning System for others' use.	[31]
	ASU4	I use the Cloud E-Learning System in my studies.	[31]
	ASU5	The Cloud E-Learning System has helped me in achieving my learning goals.	[8]

Appendix B

Table A2. E-Learning Service Quality Models and Factors.

Research Title	Factors	Model/Theory (If Any)	Ref.
Evaluating E-learning systems success: An empirical study	Learner Quality	TAM, DeLone and McLean information systems, EESS Model	[8]
	Learner's Attitude, Learner's Behavior, Learner's Anxiety, Previous Experience, Learner's Self-Efficacy		
	Instructor Quality		
	Instructor's Attitude, Enthusiasm, Responsiveness, Subjective Norm, Communication		
	Service Quality		
	Providing Guidance and Training, Providing Help, Staff Availability, Fair Understanding, Responsiveness		
	Information Quality		
	Accessibility, Understandability, Usability, Content Design Quality, Up to Date Content, Conciseness and Clarity		
	Technical System Quality		
	Ease of Use, Ease to Learn, User Requirements, System Features		
	System Availability, System Reliability, System Fulfilment, Security, Personalization		
	Education System Quality		
	Assessment Materials, Diversity of Learning Styles, Effective Communication, Interactivity and Communication		
	Support System Quality		
	Ethical Issues, Legal Issues, Promotion and Trends		
E-learning success determinants: Brazilian empirical study	Collaboration Quality, Service Quality, Information Quality, System Quality, Learner Computer Anxiety, Instructor Attitude Toward E-Learning, Diversity in Assessment, Learner Perceived Interaction with Others, User Perceived Satisfaction, Use, Individual Impact	DeLone and McLean information systems, E-Learning satisfaction	[50]
Factors determining e-learning service quality	Service Quality (SERQUAL)	SERVQUAL, DeLone and McLean information systems	[19]
	Reliability, Assurance, Tangibility, Empathy, Responsiveness		
	Information Quality (Learning Content)		
	Presentation, Structure, Interactivity, Language, Delivery Modes		
	System Quality (Course Website)		
	Interface Design, Navigation, Attractiveness, Ease of Use		
Survey of quality models of e-learning system	Teaching, Learning environment, Efficiency, Performance, Reliability, Usability, Interface, Interaction, Social, Services, Personalization Learning activates, Access, Cost, Technology, Learner, Admin, Institution, Instructor, Evaluation, Delivery, Content		[51]

Table A2. Cont.

Research Title	Factors	Model/Theory (If Any)	Ref.
A model for evaluating e-learning systems quality in higher education in developing countries	Course Development	DeLone and McLean information systems And others	[32]
	Course Information, Course Structure, Course Organization, Course Layout		
	Institutional		
	Funding, Policies, Infrastructure		
	Learner Support		
	Content Support, Social Support, Admin Support		
	Overall		
	User satisfaction Performance, Learning effectiveness, Cost effectiveness, Academic achievement		
	Assessment		
	Assignments, CATS, Examinations		
User satisfaction model for e-learning using smartphone	Demeanor, Responsiveness, Competence, Tangible, Completeness, Relevance, Accuracy, Currency, Training provider, Easier to the Job, Increase Productivity	TAM, DeLone and McLean information systems	[20]
Mediating Role of Student Satis. on the Rela. Between Edu. Quality, Service Quality and Adoption of ELearning	Educational quality, Service quality, student satisfaction, integration of e-learning		[47]
Perceptions about and attitude toward the usage of e-learning in corporate training	Advantages Factors		[21]
	Employee Commitment and Motivation, Convenience and Accessibility, Customization and Outsourcing, Cost Effectiveness		
	Disadvantages Factors		
	Personal Disadvantages, Organizational Disadvantages		
Framework to improve e-learner satisfaction and further strengthen e-learning implementation	Learner dimension		[46]
	Learner Attitude Towards E-course, Learner Computer Anxiety, Learner Internet Self Efficacy		
	Instructor dimension		
	Instructor Presence and Guidance, Instructors Ability in Internet based Course		
	Course dimension		
	ELearning course flexibility, ELearning course quality		
	Technology dimension		
	Technology Quality, Internet Quality		
	Design dimension		
	Perceived Usefulness, Perceived Ease of Use		
	Environmental dimension		
	Diversity in Assessment, Learner Perceived Interaction with other, University support and Services		
Integration of web services with E-Learning for knowledge society	Feedback/Evaluation, Technological Infrastructure, Communication tools, Resources Knowledge Sharing, Content Course Management, Knowledge content/digital resources, Suitable ELearning environment		[52]

<div align="center">**Table A2.** Cont.</div>

Research Title	Factors	Model/Theory (If Any)	Ref.
Measuring information, System and Service Qualities for the Evaluation of E-Learning Systems in Pakistan	System quality, service quality, information quality, user satisfaction	DeLone and McLean information systems	[15]
Factors Influence e-Learning Utilization in Jordanian Uni. Academic Staff Perspectives	Self-Efficacy, Facilitation Conditions, Technology Facilitating Conditions, Resource Facilitating Conditions, Facilitating Government Support	Decomposed Theory of Planned Behavior (PBC)	[13]
Assessment criteria of E-learning environments quality	Content of e-platform course, e-platform modules, tools for content delivery, technological features, management tools		[53]
Service quality perceptions in higher education institutions: the case of a Colombian university	Quality of the object (education or research itself), Quality of the Process, Quality of infrastructure, Quality of interaction and communication, Quality of the atmosphere	5Qs Model (originally proposed by Zineldin 2006)	[54]
A hybrid approach to develop an analytical model for enhancing the service quality of e-learning	Human resource, Operating abilities, Service process, Information requirements, Management system, Curriculum development, Teaching materials, Instructional design, Instructional process, Navigation & tracking, Instructional media, Instructor support, Technology, Evaluation		[14]
A model for measuring e-learning systems success in universities	Technical quality of the system, Educational quality of the system, Content and Information quality, Service quality, User satisfaction, Intention to use, Use of the system, loyalty to system, Intention to use, Goals achievement	DeLone and McLean information systems	[29]
Using SERVQUAL to assess the quality of e-learning experience	Assurance, Empathy, Responsiveness, Reliability, Web site content, E-learning quality, Satisfaction, Behavioral intentions, Grade expectations	SERVQUAL, Behavioral intention	[31]
How do Students Measure Service Quality in e-learning A Case Study Regarding an Internet-based University	learning process, administrative processes, teaching materials and resources, User's interface, Relationships with the community network, Fees and compensations	Critical Incident Technique (CIT)	[55]
Learners' acceptance of e-learning in South Korea: Theories and results	Instructor characteristics, Teaching materials, Design of learning contents, Playfulness, Perceived usefulness, Perceived ease of use, Intention to use e-learning.	TAM	[28]

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