

MEASURING INFORMATION, SYSTEM AND SERVICE QUALITIES FOR THE EVALUATION OF E-LEARNING SYSTEMS IN PAKISTAN

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ABSTRACT: Higher education institutes have integrated e-learning systems (ELS) in their educational infrastructure. The development and implementation of ELS needs continuous quality evaluation and assessment to attract more learners. A conceptual model consisting of system, service and information qualities was evaluated to measure the user satisfaction. Data was collected from 356 learners including Post Graduate (52%) and Graduate (48%) students of Virtual University, Pakistan. To investigate the research hypotheses, Structural Equation Modelling (SEM) was employed. The empirical analysis indicated that information quality (0.38, $p < 0.05$), service quality (0.14, $p < 0.05$) and system quality (0.48, $p < 0.01$) were the positive and significant indicators for user satisfaction. The variance explained by the model is 71% that showed the significance of model.

Keywords: E-learning systems, Information quality, Structure Equation Modelling and User satisfaction.

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INTRODUCTION

The most prominent technique of delivering knowledge via modern technologies of information and communication is e-learning. Now a days, e-learning facilitates in higher education to expedite the learning process (Lee and Lee, 2008 and Wang *et al.*, 2007). The new paradigm in education brings drastic changes in teaching and learning. E-learning, due to its effectiveness and efficiency, positively affects its stakeholders. The stakeholders are involved in the use of e-learning irrespective of its geographical boundaries. ELS supports its stakeholders in gaining knowledge with self-organized, personalized learning and flexibility in collaborative learning (Mohammadi, 2015; Alsabawy *et al.*, 2013 and Liaw and Huang, 2013). The growing trends of ELS in the educational structure needs continuous quality assessment for development, successful implementation and continued use (Masoumi and Lindström, 2012). Virtual University of Pakistan (VUP) was established in 2002 to meet the needs of today's educational challenges. The mission of VUP is to provide quality education irrespective of gender discrimination and geographical boundaries.

Information System Success (IS-success) models of Delone and McLean (D&M) are widely accepted for evaluation (Delone and Mclean, 2003). The acceptance of IS-success is considered as a suitable theoretical model to evaluate the success of ELS. System, service and information qualities are the vital constructs of IS-success whereas user satisfaction is the measurable construct (Mohammadi, 2015; Wang and Chiu, 2011 and Chen, 2010). IS-success is followed by user satisfaction

which enhances intention towards the use of ELS (Petter *et al.*, 2008).

The goal of present study was to address the effects of quality features including system, service and information of ELS on user satisfaction.

MATERIALS AND METHODS

The research study was aimed to evaluate the user satisfaction of ELS by assessing the system, service and information qualities via learners' perspective using quantitative approach. In this study, a survey based on online questionnaire was used to collect data and statistical exploration was performed to evaluate the results. SPSS 21.0 was used to perform the reliability and validity. To measure the convergent, discriminant validity and scale reliability, the Confirmatory Factor Analysis (CFA) was adopted. To ensure the measurement model, AMOS 20.0 was used to evaluate the assessment model. To estimate the parameters of the model based on variance-covariance matrices, the maximum likelihood method was adopted (Hair *et al.*, 2013).

Data Collection: To collect data, an online survey proforma was disseminated to the learners of the Virtual University of Pakistan to evaluate the user satisfaction towards e-learning systems. Graduate and postgraduate students were registered in the discipline of Information Technology, Computer Science and Business Administration at Virtual University of Pakistan.

Measures of construct: The constructs of this study were obtained from prior studies. The questionnaire comprised of two sections i.e. respondent's demographic information and satisfaction. All questionnaire items were

measured by five-point likert scale from “strongly disagree = 1” to “strongly agree = 5” (Lehmann and Hulbert, 1972). The measures of service, information and system qualities were determined as per studies of (Hassanzadeh *et al.*, 2012; Lin and Wang, 2012; Chen, 2010; Ozkan and Koseler, 2009 and Roca *et al.*, 2006). The measure of user satisfaction was adapted as per studies of (Hassanzadeh *et al.*, 2012 and Holsapple and Lee, 2006).

Research Model: The conceptual model comprised of quality features of ELSi.e. system, service and information qualities were the measureable construct of evaluation and assessment of quality.

System Quality: The system quality was oriented with technical specification like the efficiency and accuracy of the system (Mohammadi, 2015). The measure constituted the ease of use, response time, capability of data processing and reliability of the system (Balaban *et al.* 2013 and Gorla *et al.* 2010).

H1: System quality positively influence user satisfaction.

Service Quality: The service quality was the measure of quality provision that a system user received from the IT support and IS department personnel. The indicators used were assurance, reliability, empathy and responsiveness

(Nizamani and Khoubati, 2014 and Ozkan and Koseler, 2009).

H2: Service quality positively influence user satisfaction.

Information Quality: The information quality consisted of relevance, completeness, accuracy and understandability of the information delivered by the ELS (Eom *et al.*, 2012).

H3: Information quality positively influence user satisfaction.

RESULTS AND DISCUSSION

Data Analysis: Initially, demographics of the data was analyzed along with the validity and reliability test of the hypothesized model. The next stage consisted of hypotheses testing and structural analysis of the model.

Demographic analysis: The first measure of the analysis consisted of the respondents' demographic statistics. Table-1 depicted the detailed profile of respondents. Out of 356 responses collected, males were 71% and females were 29%. Most of the respondents were from Punjab (83%) followed by Sindh (10%), Khyber Pakhtunkhwa (6%), and Baluchistan (1%). No response was discarded from the final study.

Table-1: Demographic analysis of the respondents.

Characteristics of respondents		Frequency	Percentage
Education Level	Post Graduate	186	52
	Graduate	170	48
Gender	Male	254	71
	Female	102	29
Province	Punjab	296	83
	Sindh	36	10
	KPK	21	06
	Baluchistan	3	01
Experience of using e-learning system (Years)	1-2	178	50
	3-4	120	34
	5 and above	58	16

Analysis of Measurement Model: To evaluate the measurement model, reliability and convergent validity were measured via Confirmatory Factor Analysis. The reliability analysis was performed to test the consistency and internal validity of the items used for each variable. To measure the internal consistency of the constructs, Cronbach's α was used. The value greater than 0.70 indicated the recommended threshold of Cronbach's α (Table-2).

The convergent validity was estimated by the methods of composite reliability and average variance

extracted (AVE). The AVE is the amount of variance shared by the variables to the amount of variance in measurement errors (Fornell and Larcker, 1981). Whereas, the sum of variance and covariance of variables divided by total variance is the composite reliability. The composite reliability ranging from 0.82- 0.91 depicted that all the items surpassed the threshold recommended value of 0.60. Therefore, the results demonstrated the acceptable reliability of the instrument items. Moreover, the values greater than 0.50 of AVE showed that all the items exceeded the threshold value (Table-2).

Table-2: Reliability analysis and convergent validity.

Constructs	Cronbach's α Value (> 0.70)	AVE (> 0.50)	Composite Reliability (> 0.60)
Service Quality	0.911	0.597	0.864
System Quality	0.861	0.550	0.820
Information Quality	0.924	0.564	0.918

Structural Model Analysis: Having proven the reliability and convergent validity, Structural Equation Modelling (SEM) was performed for the hypotheses testing. SEM was considered to be a better approach for examining multiple equations of dependence relationship and testing the theories. It provided insight that allowed simultaneous examination of a series of dependent relationships among the variables of the model (Hair *et al.*, 2013; Byrne, 2010 and Fornell and Larcker, 1981). AMOS 20.0 was employed and the maximum likelihood method was adopted to evaluate the parameters of the

hypothesized model based on variance-covariance matrices.

To assess the research model, a variety of fit indices should be considered as recommended for SEM applications. Table-3 showed the nine fit indices used and the threshold values indicated the acceptable model fit (Byrne, 2010). Table-3 indicated the threshold values of acceptable fit against the fit indices of the hypothesized model of this study. The fit indices were within the acceptable range.

Table-3: Fit indices of hypothesized model.

Fit indices	Threshold values	Hypothesized model
χ^2/df	<5 preferably <3	2.182
Goodness of Fit Index	>0.90	0.930
Comparative Fit Index	>0.90	0.976
Adjusted Goodness of Fit Index	>0.80	0.896
Normed Fit Index	>0.90	0.958
Parsimony Normed Fit Index	>0.60	0.720
Root Mean Square Error of Approximation	<0.08	0.058
Relative Fit Index	Close to 1	0.944
Root Mean Square Residual	Close to 0	0.035

The next step of data analysis in this study was to analyze the significance of the relationships in the hypothesized model. Table-4 illustrates the detailed results of the hypothesized relationships. The results of this study indicated that the endogenous variables like service quality ($\beta=0.143$ and $p<0.05$), information quality ($\beta=0.415$ and $p<0.05$) and system quality ($\beta=0.450$ and $p<0.01$) significantly affected the satisfaction. The t-value was greater than 1.96 depicted the significance level. The t-value for system, service and information qualities are 2.135, 2.804 and 2.036 respectively indicated the significance of path coefficients.

The R^2 value and path coefficients are depicted in Figure 1. This study calculated the R^2 which indicated the amount of variance endogenous variables explained by the exogenous variables. The strength of dependent and independent relationship were specified by the standardized path coefficients which were 0.48 for system quality, 0.14 for service quality and 0.38 for information quality. The t-values and path coefficients are also illustrated in Figure 1. The model explained that the 71% of variance in the construct were of satisfaction, thus supporting H1, H2, H3. Moreover, the path coefficients

of each exogenous variable on endogenous variable were used to calculate the Total effect. The Total effect was measure by the following equation reported by (Hair *et al.*, 2013)

Total effect of information quality = $(0.38+0.078+0.302) = 0.76$

Similarly, the Total effect of system quality and service quality was 0.79 and 0.61 respectively. Hence, all the exogenous construct are strong predictors of satisfaction.

The findings indicated that the system quality was significant in the assessment of an ELS. The finding was consistent with the results of prior studies conducted by (Mohammadi, 2015; Alsabawy *et al.*, 2013; Eom *et al.*, 2012; Hassanzadeh *et al.*, 2012; Chen, 2010 and Ozkan and Koseler, 2009). System quality was the measure of technically sound and error-free system which in turn increased the satisfaction of learners for the use of ELS. Another hypothesis (H2) was also found to be significant where service quality was the direct and significant predictor of satisfaction towards the future use of ELS. The findings were consistent with the prior research conducted by (Mohammadi, 2015; Balaban *et*

al., 2013; Wang and Chiu, 2011 and Ozkan and Koseler, 2009).

Table-4: Hypotheses testing results.

Hypotheses	Path		B	t-value	p-value	S.E	Results
H1	System Quality → Satisfaction	Quality	.450	2.135	.033	.211	Supported
H2	Service Quality → Satisfaction	Quality	.143	2.804	.005	.051	Supported
H3	Information Quality → Satisfaction	Quality	.415	2.036	.042	.204	Supported

Note: (p<.001, p<.01, p<.05)

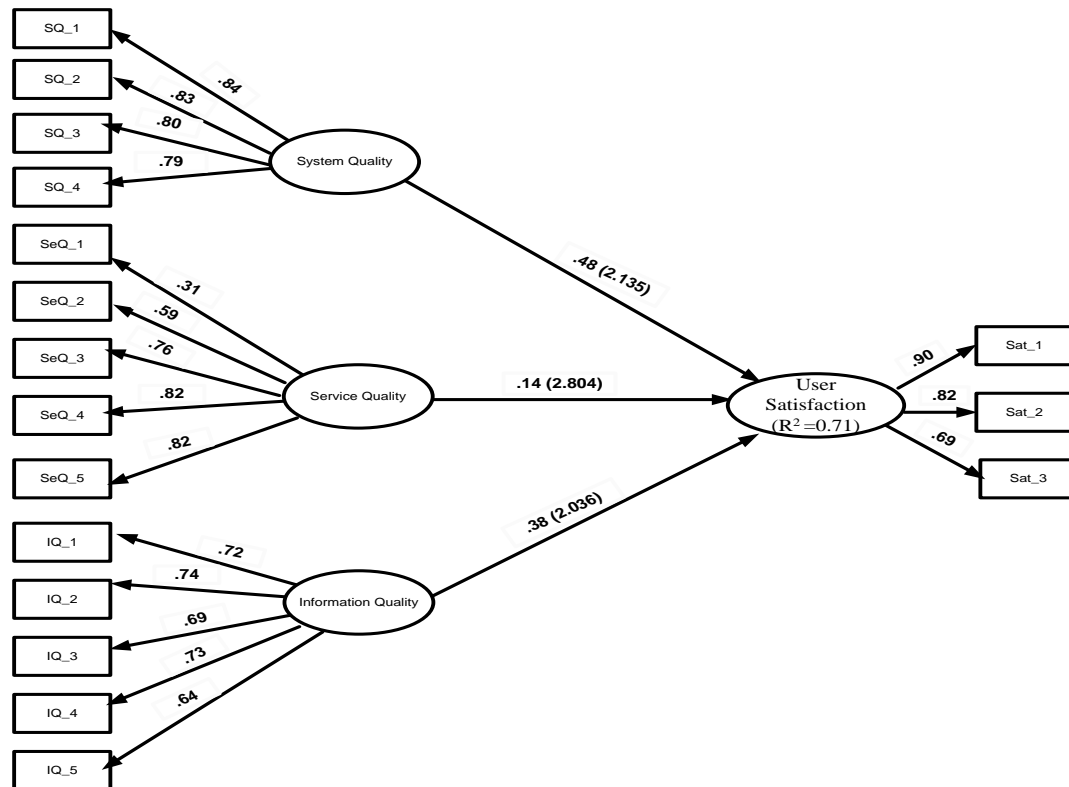


Figure 1: Path analysis of structural model

Moreover, the results of the present research support H3 where learners' satisfaction was positively influenced by the information quality and the findings were also consistent with the prior research carried out by (Mohammadi, 2015; Salem and Salem, 2015; Alkhalaf et al., 2012; Eom et al., 2012; Ozkan and Koseler, 2009 and Roca et al., 2006). Information quality like relevancy, completeness and accuracy of information and contents increased the learner's satisfaction. In addition, user friendly, required and up-to date information and content produced by the information system enhanced the satisfaction of the learner.

User satisfaction led to achieve the learners' educational goal. In this study, the variance explained by the satisfaction was 71%. The model was statistically

significant and the results were consistent with the prior research reported by (Eom et al., 2012 and Wang and Chiu, 2011).

In a study conducted by (Ghiasi et al., 2013) evaluated the three quality constructs to measure the ELS intention and inept to clarify the user satisfaction. (Niwaz et al., 2013) emphasized only the influence of service quality to evaluate the user satisfaction in job placement. The quality assessment and evaluation were the endeavoring factors in the ELS enhancement and promotion. This research asserted the values in the theoretical and practical implication of ELS assessment and evaluation.

In the last decade, Virtual University of Pakistan improved itself to a high extent, but the

advancement and continuous improvements were required to enhance the educational infrastructure. The need was to pay attention to the quality features of ELSlike service, information and system qualities to retain satisfaction of the learner and attract learners trust.

Conclusion: This study empirically examined the quality features influencing user satisfaction towards the use of e-learning system. Quality features like system, service and information qualities positively and significantly affected the user satisfaction. The findings indicated that designing educational contents with understandability, relevance, accuracy and consistency must evoke learner's interest. The availability of the e-learning systems, interaction and response time are recommended which significantly affect the user satisfaction for future use. Moreover, reliability, ease of use and efficiency positively affect the user satisfaction and enhances the learner's interest towards using the ELS.

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