Factors Determining E-Learning Service Quality

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Abstract:- Use of e-learning programs has been expanding, owing in part to the high demand for education, particularly in developing countries. The success, however, of these programs shows varied results. Very little research addresses the issue of e-learning service quality in higher education environment. Therefore, it has become vital to assess the quality of e-learning offerings, as it is critical to the program success and survival. In this study, we propose a modified the SERVQUAL instrument for use in assessing e-learning quality. This instrument consists of six dimensions: Assurance, Reliability, Empathy, Responsiveness, Tangibility and Learning content. Exploratory Factor Analysis (EFA) was conducted to investigate the reliability and validity of the measurement model, and multiple regression analysis was used to test the research model. The finding after data analysis of 421 students reveal that "Learning content" plays a significant role in the perception of e-learning quality, which in turn effects learners' satisfaction and further intention to use e-learning (Godwin et al 2011).

Keywords: e-learning, service quality, satisfaction, SERVQUAL, learning content, SEM

1 Introduction

As a result of increased accessibility to computer-based solutions, the learning methods used by higher education institutions are changing significantly. This is enhanced by the fact that teaching and learning is no longer restricted to traditional classrooms, and or the need for physical presence (Marold et al., 2000; McAllister and McAllister, 1996; Zhang & Nunamaker, 2003). There has been a significant and permanent shift in higher education and the learning processes as a result of information and communication technology (ICT); especially driven by Internet based technologies. Technology-driven distance education (e-learning) appeals to many because of the convenience (Doherty, 2006; Levy, 2007), and the fact that e-learning is ubiquitous, i.e. not limited by instructors and learners being separated by distance, and or time (Raab, Ellis & Abdon, 2002). Major benefits include reduced education cost, increased delivery consistency, timely content, flexible accessibility, and increased convenience for distance and working students (Cantoni et al., 2004; Kelly and Bauer, 2004). By considering the responses of students who have participated in e-

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learning courses, it is possible to better understand the reasons why students are often dissatisfied with the e-learning experience. E-learning dropout rates are approximately 10–20% higher than in traditional settings (Diaz and Cartnal, 1999), partly because of perceived lower quality (Levy, 2007; Lykourentzou et al., 2009; Richards and Ridley, 1997), and partly because of other factors such as attainment value, utility value, and social isolation (Chiu and Wang, 2008; Wang, 2003). Research has attempted to identify particular student characteristics or other factors that can be used to predict whether a student might drop out of, or otherwise fail to achieve satisfactory results in an e-learning course (Bouhnik & Marcus, 2006). Bouhnik and Marcus (2006) stated that students' e-learning dissatisfaction was based on the lack of three factors, i.e. lack of a firm framework to encourage students to learn, lack of the high level of self-discipline required, and absence of a learning atmosphere. Since the E-learning traditionally minimizes contact with people, students experience a reduced level of discussion and support amongst students. In other words, e-learning lacks interpersonal and direct interaction among students and teachers. Additional characteristics and other factors identified in previous studies, include: clarity of program design, interaction with instructors, and active discussion in the context of the course (Swan, 2001).

The ability to accurately evaluate the quality of e-learning is important to all stakeholders (Gress et al., 2010). Moreover, the ability to develop and apply metrics that accurately identify factors affecting e-learning should be used to improve course quality, and subsequently reduce student dropout rate (Udo et al., 2011). For students, if factors are considered and counter measures are implemented, which should lead to a greater satisfaction with the distance learning course. For e-learning providers, it can be used to assist in differentiating their products. For corporations, it can lead to more effective training programs.

One strategy, which relates to success in these businesses, is the effective delivery of a high quality service (Rudie and Wansley 1985, Thompson; DeSouza and Gale, 1985). Delivering high quality service is considered an essential strategy for business success and survival (Zeithaml et al. 1996; Reichheld and Schefter 2000), yet this requires higher education providers to fully understand how high quality service can be defined.

2 Understanding Quality in Higher Educational Service Delivery

Quality is a subjective term for which each person or sector has its own definition. Yang et al note that according to American Society for Quality, technical definition of quality can have two meanings: 1. the characteristics of a product or service that bear on its ability to satisfy stated or implied needs; 2. a product or service free of deficiencies (Yang et al., 2003). According to Joseph Juran (1981), quality means "fitness for use;" according to Philip Crosby (1979), it means "conformance to requirements". Early literature concerning quality has come primarily from the sector relating to 'goods' quality. According to zero defect principles, based on the Japanese philosophy, 'quality is zero defects, doing it right the first time' (Crosby 1979).

While the definitions of quality and its determinants may vary, its importance to companies and its consumers is undeniable; both for goods and service sectors. However, knowledge of goods quality is not enough to understand service quality. The three characteristics of services, i.e. intangibility, inseparability and heterogeneity, have to be acknowledged to understand service quality (Parsuraman et al., 1985). In an attempt to explain the concept of quality in the service sector, the SERVQUAL model, which has its roots in the Expectation-Confirmation Theory (Oliver, 1980), was proposed by Parasuraman, Zeithaml and Berry in 1988. SEVQUAL has become a valid and reliable customer-centric scale, which is used to measure the quality of service delivery in environments as diverse as retail and business consulting, may be used to measure and eventually improve the quality of service delivery in e-learning. SERVQUAL aims to measures the gap between customer expectations and their satisfaction with the services provided. The basic supposition of the measurement is that customers

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can evaluate a company's service quality by comparing their perceptions with their expectations. If what is perceived is below expectation, then the customer sees the quality to be of low quality and if what is perceived meets or exceeds expectation, than the customer sees the quality as being high. The initial SERVQUAL model had 10 dimensions, however, by the early 1990s, the authors had refined the model to the useful acronym RATER, which refers to five constructs: Reliability, Assurance, Tangibles, Empathy and Responsiveness. Under each construct, the service quality is assessed by finding the difference in the user expectation and user experience. Details of these constructs are listed in Table 1.

Constructs	Description
Reliability (RA)	Ability to perform the promised service dependably and accurately.
Assurance (AS)	Knowledge and courtesy of employees and their ability to inspire trust and confidence.
Tangibles (TA)	The appearance of physical facilities, Equipment, personnel and communication materials.
Empathy (EM)	Caring, individualized attention the service firm provides to its customers.
Responsiveness (RS)	Willingness to help customers and provide prompt service.

Table 1: Constructs of SERVQUAL

Within the SERVQUAL model, five potential organizations gaps should be measure, monitor and/or filled. These gaps are:

Gap 1: Management perception: the difference between the expectation of the customer and the management's perception of the expectation of the customer.

Gap 2: Quality specification: the difference between management perception and the actual specification of the customer experience.

Gap 3: Service delivery: the difference between customer driven service design and standards and service delivery.

Gap 4: Market communication: the difference between the delivery of the customer experience and what is communicated to customers.

Gap 5: Perceived service quality: the difference between a customer's perception of the experience and the customer's expectation of the service.

The main benefit of SERVQUAL, as a measuring tool, is its application in a range of domains. SERVQUAL has been used to examine numerous service industries, such as healthcare, banking, financial services and information systems service quality (Jiang et al. 2000; Kang et al. 2002; Kettinger et al. 2005). Although SERVQUAL has been widely accepted as a valid instrument for measuring service quality, in several industries over the last 25 years, the instrument has not been applied to an educational setting until recently (Petruzzellis, D'Uggento, & Romanazzi, 2006; Stodnick & Rogers, 2008), when the metric was applied to the concept of ''total student experience'' in physical classroom encounters. Rowley (2006) asserted that since research concerning electronic service (e-service) is still in its infancy, additional effort is needed to understand and refine what factors affect e-service quality, and subsequently effort is needed to develop the most appropriate metrics for on-going service monitoring in the educational domain.

Stodnick and Rogers (2008) were among the first to use SERVQUAL to evaluate how traditional students perceived learning quality. Of the five SERVQUAL dimensions, they found that three (assurance, empathy, and reliability) were significant predictors, and so concluded that the instrument could be used to assess student satisfaction and their perception of instruction quality. Our study adopts Stodnick and Rogers' questionnaire, with minor modifications, to reflect an e-learning environment as online education can be seen as a type of service whose quality can be assessed using modified SERVQUAL.

2.1 Considering 'Learning Content' and Delivery in Teaching Quality

"Learning Content"(LC) refers to the material and services provided that directly relate to and result in

student learning. In e-learning, since the material is delivered via the internet, a website-based form of visualisation is almost essential for the delivery of e-learning material. However, the distinction between 'learning content' and 'website content' needs to be appreciated. Udo and Marquis (2002) defined 'website content' as the presentation and layout of information and functions that capture the overall firm presence and its public image, and is assumed to affect how a customer perceives web service quality (Udo and Marquis, 2002). The construct includes such dimensions as information quality, appropriateness of the amount of information, types of media, presentation mode, size, and types of images, and the overall appeal of the website. Content quality perception can be compromised by too little or too much information, or by the appeal it presents to the visitor.

3 Objective of the Study

The objective of this research is to identify whether SERVQUAL is a suitable model to assess the quality of e-learning. To achieve this, and in light of the above discussion, we propose an adapted SERVQUAL model that considers inclusion of "Learning Content", along with the original five dimensions used in SERVQUAL; to measure e-learning students' perceptions of service quality, and determine what factors have the biggest influence on the student expectation of quality. Our modified e-learning quality (LQ). model based on SERVQUAL is shown in Fig 1.

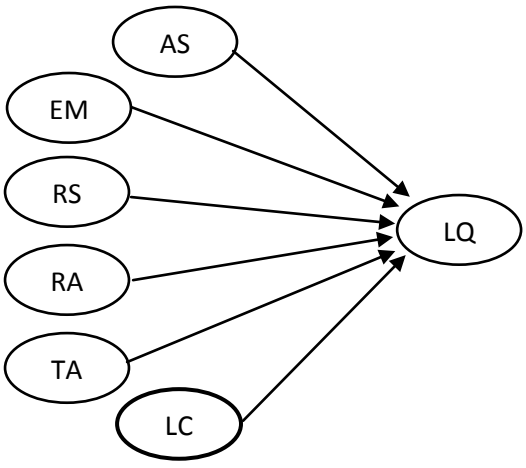

Fig. 1: Proposed model with additional dimension of 'Learning Content'

The purpose of this research study is to determine:

1. Is SERVQUAL a suitable model to access the quality of e-learning?

2. Which dimension(s) of the modified model have a significant impact on the perception of e-learning quality?

In past studies, authors have stated that since the e-learning environment is different from the traditional one, online student satisfaction may be influenced by a different set of factors, such as the instructor's availability and response time, communication, technology, course website, and other factors (Liaw, 2008; Liu et al., 2009; Suthers, Hundhausen, & Girardeau, 2003). Online instructors are both facilitators and motivators of e-learning; therefore, Liaw (2008) concludes that instructor availability and response time influences how e-learners perceive quality and hence, how satisfied they are with online education. Effective communication between the instructors and e-learners, as well as between e-learners, has been identified by Liaw, Huang, and Chen (2007) as factors that can affect perceptions of quality. Our Hypotheses are:

H1: In an e-learning environment, "Reliability" has a positive association with students' perceptions of e-learning quality.

H2: In an e-learning environment, "Assurance" has a positive association with students' perceptions of e-learning quality.

H3: In an e-learning environment, "Tangibility" has a positive association with students' perceptions of e-learning quality.

H4: In an e-learning environment, "Empathy" has a positive association with students' perceptions of e-learning quality.

H5: In an e-learning environment, Responsiveness" has a positive association with students' perceptions of e-learning quality.

H6: In all modes of e-learning, "Learning Content" has positive association with students' perceptions of e-learning quality.

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4 Data Collection and Instrument

A questionnaire we used to collect participant data, which consisted of two sections. In section one we asked demographic questions. In section two we measured psychometric values, which was the main part of the questionnaire. There were 39 questions in total, 5 relating to demographic questions, and 34 questions relating to SERVQUAL. A five point Likert scale was used in section two of the questionnaire.

Previous research has successfully used University students when modelling attitude-behaviour relationships and scale development is appropriate (Yuvas, 1994). Moreover, university student (undergraduates, postgraduates and executive) are used in numerous studies covering perceptions of quality (Udo, Bagchi, & Kirs, 2010; Van Iwaarden, vander Wielaea, Ball & Millen, 2004: Yavas, 1994). Accordingly, after conducting a short pilot testing, to test the reliability of questions, the questionnaire was administered to students in a range of classes at two major public universities in Lahore, Pakistan. These students were enrolled on BSc Applied Management, BBA honours, MBA, EMBA, BSc Sciences and BSc Engineering programs. A total of 490 students, most of whom had previously had exposure to e-learning content, participated in the survey. A total of 421 questionnaires were considered usable. See Table 2 for demographic data.

Gender	Male	63.7% (268)
	Female	36.3% (153)
Age		
Program of Study	BSc/BBA(Hons.)	63.5% (67)
	MBA	16.2% (68)
	EMBA	6.9% (29)
	BSc Engineering	8.6% (36)
	BSc Sciences	5% (21)
Household Income (Monthly)	Below Rs. 20,000	9.7% (41)
	Rs. 21,000 to Rs. 50,000	27.8% (117)
	Rs. 51,000 to Rs. 100,000	37.3% (157)
	Above Rs. 100,000	24.9% (105)
Schooling	Public	31.6% (133)
	Private	68.2% (287)

Table 2: Respondent demographics' data

4.1 Survey Material

In section two, wherever possible, we used the previously validated questions. In some cases, however, where the survey questions were designed for face to face learning environment, minor modifications were made to reflect the e-learning environment. A complete list of questions is given in Appendix A.

4 .2 Original SERVQUAL constructs

The instrument used to measure the original SERVQUAL consisted of 18 questions, which have been used widely in previous research (Cao et al, 2005; Stodnick and Rogers, 2008; Olorunniwo et al, 2006). The items, in this research, which capture each of the five original constructs of SERVQUAL (Assurance, Empathy, Responsiveness, Tangibility and reliability) were taken from Olorunniwo et al. (2006) and Stodnick and Rogers (2008) but modified to reflect use in context of online learning environments. Questions relating to "Learning Content" were taken from Cao et al. (2005), who developed, and validated, an instrument for measuring business-to-customer website quality satisfaction using 71 online customers. Six items, previously used in other related studies (Wang, 2003; Zhang & Prybutok, 2005), were used in our study to collect and measure user responses concerning layout, audio/visual effect, appeal, accuracy, comprehensiveness of subject material, quality and appropriateness of learning material. Four items, developed and used in previous studies (Cao et al, 2005, Chiu et al, 2005), were used to access measurement of quality. It was difficult to find relevant studies, supported by evidence, that focus on e-learning service quality but similarities between e-learning and e-services can be expected, since both are internet based. Many previous studies, relating to service quality, suggest that it would be necessary to add and modify SERVQUAL, to create a unique and

comprehensive conceptual model of service quality, depending on the nature of the service sector under investigation (Carman, 1990; Cronin and Taylor, 1992; Parasuraman and Grewal, 2000).

5 Data Analysis and Results

SPSS statistics 19 and AMOS 22 were used to facilitate data analysis; with SPSS used for basic statistics, and AMOS supporting regression (structural equation modelling) and model testing. Results will be presented in three sub-sections relating to respectively i) reliability, ii) Exploratory Factor Analysis and iii) Fitness of results.

5.1 Reliability and Validity

We began by testing the reliability of the six individual SERVQUAL constructs. Reliability assessment was done using Cronbach Alpha (Cronbach, 1951; Nunnully, 1978). Cronbach alpha values measure of internal consistency. The lowest value 0.828 is well above Nunnally's suggested cut off values of 0.70.

After assessing the scale reliability, we turned to explored both convergent and divergent validity. Convergent validity is the extent to which indicators are associated with each other and represent a single concept. Divergent validity is the degree to which a construct and its indicators differ from other constructs and their indicators.

Factor Label	Number of Items	Cronbach's alpha
Assurance	5	0.928
Reliability	3	0.950
Responsiveness	4	0.824
Empathy	4	0.916
Tangibility	4	0.895
Learning Content	4	0.828
Learning Quality	4	0.865

Table 3: Scale Reliability

Reliability: The Cronbach's alphas for the extracted factors are shown in Table 3, along with their labels and specifications. All alphas were > 0.70. The factors are all reflective because their indicators are highly correlated and are largely interchangeable (Jarvis et al. 2003).

5.2 Exploratory Factor Analysis (EFA)

We conducted an EFA using Principal Component Analysis, with Promax rotation, to see if the observed variables adequately correlated, and met reliability and validity criteria. Promax was chosen because the dataset is quite large (n=421) and Promax can account for the correlated factors. Some of the questions had to be dropped, as they did not load well. Finally, we used a seven-factor model, depicted in the pattern matrix in table 3. This seven-factor model had a total variance of 82.33%, with all extracted factors had eigenvalues above 1.0.

	Component						
	1	2	3	4	5	6	7
LQ4_uptodate	.993						
LQ2_Website	.988						
LQ3_InstMatClear	.985						
LQ1_Percept	.981						
AS3_QueAns		.927					
AS1_InstKnow		.892					
AS6_TeamKnow		.870					
AS2_Fair		.868					
AS4_InstAns		.853					
LC2_DiffFormats			.948				
LC1_Learnpercep			.947				
LC6_Interesting			.920				
LC7_LecUrdu			.914				
EM2_IndvNeeds				.928			
EM4_StudMotivation				.922			
EM3_StudInterest				.897			
EM1_Concerned				.842			
TA2_ExpTeacher					.888		
TA3_PhyCampus					.878		
TA4_DegreeRecog					.864		
TA1_ReqUni					.852		
RA1_ConsGood						.976	
RA3_CorrectsInfo						.955	
RA4_TeamHelp						.936	
RS2_TeamHelp							.926
RS4_InstSupp							.916
RS3_TeamGuides							.663
RS1_QckResp							.653

Table 4: Pattern Matrix using Principal Component Analysis, with Promax rotation and Kaiser-Meyer-Olkin Normalization.

Adequacy: The Kaiser-Meyer-Olkin and Bartlett's test for sampling adequacy was significant, and the communalities for each variable were sufficiently high (all above 0.300 – with most above 0.600),

thus indicating the chosen variables were adequately correlated.

Validity: Items intended to measure the same construct exhibited higher loadings on a single construct than other constructs, suggesting adequate convergent validity. The recommended minimum threshold of 0.350 for a samples size of 421 (Hair et al., 2010). The factors also demonstrate sufficient discriminant validity, and there are no problematic cross-loadings.

	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.812
Bartlett's Test of Sphericity	Approx. Chi-Square	15379.004
	df	378
	Sig.	.000

Table 5: KMO and Bartlett's Test

Composite Reliability	Dim-ensions	AS	EM	RS	RA	LC	TA
0.929	AS	0.724					
0.919	EM	0.000	0.741				
0.794	RS	0.000	0.104	0.542			
0.952	RA	0.010	0.013	0.055	0.870		
0.953	LC	0.000	0.051	0.052	0.024	0.837	
0.895	TA	0.000	0.004	0.035	0.018	0.062	0.681

Table 6: Correlation Matrix.

5.3 Fitness of Results

According to Wold (1985), the quality criteria used in assessing a structural model fit is: path coefficients, composite reliability, Cronbach's Alpha and R-square. For a confirmatory model, such as ours, we require a Cronbach's Alpha of 0.80 or better, a composite reliability of 0.70 or better, and an R2 value of 0.60; to indicate a good model (Chin, 1998). In our proposed model, the composite reliability calculated through CFA in AMOS ranges between 0.794 to 0.953 (Table 6), the Cronbach's Alphas using SPSS ranges between 0.828 and 0.950 (Table 3), and the R^2 values for e-learning quality is 0.560. Based on Chin's (1998) our model is considered substantial. Fig 2 shows the path diagram and path coefficient values.

Six hypotheses were tested, i.e. the original five SERVQUAL dimensions, plus the sixth proposed dimension of 'Learning Content'; as independent variables. At the P <0.05 level, three SERVQUAL dimensions were positively related to student's perception of quality; Responsiveness, Tangibility and Learning Content. Assurance, Empathy and Reliability were not found to be significant. Regression weights are given in the table 7. The adjusted R-squared value for this model was 5.67. Our research confirms hypotheses H3, H5 and H6; confirming Responsiveness, Tangibility and Learning Content, measured using SERVQUAL, are positively associated with the perception of eLearning quality.

This research is, to our knowledge, the first to apply the SERVQUAL scale to measure student perception of service quality in an e-learning environment with an additional dimension of 'Learning Content'. Although the scale is well established and recognized for assessing service quality in the service industry, the application of it with and additional dimension is for e-learning is quite new.

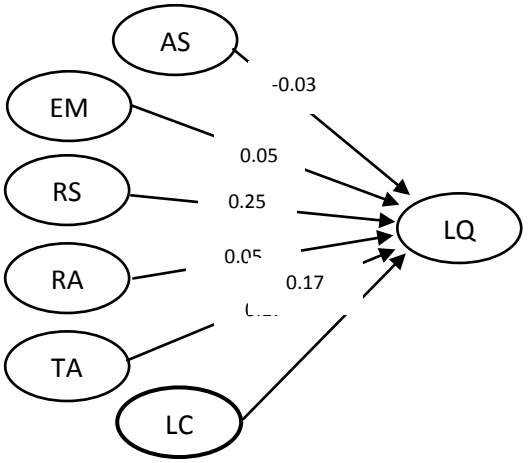

Fig 2: Learning content model with path coefficients.

All the values of indexes are in the range of criteria, which show good model fitness. In detail, the value of Chi-square/df is 1.651. And the perfect value is 1, almost cannot be reached and a value between 2.0 and 5.0 is acceptable; near 2 is good (Hau 2010). And RMSEA is 0.039, a lower REMSEA means a better fit. For CFI and NFI, a higher value

closer to 1 means better fitness, 0.986 and 0.966 respectively in our study shows good fitness. Overall, the goodness of fit indexes in this study lend good support to the validation of proposed model.

		Est	SE	CR	P
LQ	Assurance(AS)	-.034	.066	-.517	.605
LQ	Empathy(EM)	.053	.054	.972	.331
LQ	Responsiveness(RS)	.251	.055	4.527	***
LQ	Reliability(RA)	.049	.063	.778	.437
LQ	LearningContent(LC)	.172	.041	4.214	***
LQ	Tangibility(TA)	.165	.056	2.927	.003

Table 7: Regression Weights

6 Conclusion

The purpose of the study was twofold: 1) to explore the possibility of using SERVQUAL scale to assess the quality of e-learning in higher education, 2) to develop an instrument by proposing an extension in the SERVQUAL scale to capture the dimensions of e-learning quality.

We propose a modified SERVQUAL instrument for assessing e-learning quality, which consisted of six dimensions: Assurance, Reliability, Empathy, Responsiveness, Tangibility and Learning content). In our proposed model, the composite reliability ranges between 0.794 and 0.953 (Table 6), the Cronbach's Alphas ranges between 0.828 and 0.950, and the R^2 values for e-learning quality is 0.560. According to Chin's (1998), our model is considered substantial.

In addition, our research confirms hypotheses H3, H5 and H6; validating that Responsiveness, Tangibility and Learning Content, measured using SERVQUAL, are positively associated with the perception of e-Learning quality. H1, H2 and H4, were found to be false, and therefore do not significantly impact learning quality perception, which has interesting implications for e-learning program design and delivery. E-learning programs are often designed and or delivered, using physical program material, to facilitate virtual learning for the masses. In developing countries there is considerable interest in e-learning programs, however the bandwidth and infrastructure provision is often limited. This work concludes that perception of e-learning quality is primarily dependent on Responsiveness, Tangibility and Learning Content. Despite its virtual nature, 'quality e-learning' provision must ensure that it neither ignores the physical (i.e. the appearance of physical facilities, Equipment, personnel and communication materials), or temporal needs of student (i.e. a willingness to help customers and provide prompt service). Moreover, to ensure delivery of e-learning quality perception, it is vital that e-learning practitioners understand, and define how learning content should be developed; a factor of particular importance in areas impacted by poor infrastructure or bandwidth.

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