

# The Effect of Service Delivery Quality on Customer Value of e-Learning Systems

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**Abstract**—E-learning systems are an essential electronic application in universities and many other training organizations. The users of e-learning expect to receive educational services with high quality and value. The role of service delivery quality in enhancing customer value is investigated in this study. Structural equation modeling was used to analyze the responses from a survey of 720 university students. The results confirmed that service delivery quality enhances customer value and in particular customer value is affected by efficiency, fulfillment, responsiveness and contact.

**Keywords** — *e-learning systems; service delivery quality; customer value.*

## I. INTRODUCTION

The education sector has been radically transformed by substantial investments in Information Technology (IT) infrastructure [1]. However, E-learning systems are yet to have an approach for measuring success. Research dealing with e-learning system success issues has Service Delivery Quality (SDQ) as a critical component in creating success. Value is the main measure for assessing the benefits of IT. Research has explored issues related to measuring the value of IT. Customer value has been used broadly to measure benefits generated by IS and the success of these systems.

### A. Research Problem

A major concern of senior managers is the lack of success of new IS projects and their failure in achieving expected goals [2]. This problem extends to e-learning systems. Despite considerable funds invested some organisations continue to fail to deliver the expected benefits from e-learning projects [3]. For students, the main expected benefit is enhancing academic performance, educational satisfaction, social value, and career development. E-learning systems are dependent upon digital media and telecommunications, and any shortcomings may lead to user dissatisfaction. Zeithaml [4] states: “Too many companies are performing poorly in delivering service on the web,

and a large part of this problem is the lack of complete understanding of what customers want in this medium” [4p. 135]. The problem that this study aims to explore is: *Does service delivery quality of e-learning systems enhance customer value? If so, which sub-dimensions of this construct can affect customer value?*

### B. Study Objectives

E-learning systems are recent and advanced electronic applications, and there is ambiguity about the factors that affect the success of these types of systems. SDQ is proposed as a critical construct for enhancing the success of e-learning systems through measuring benefits. The main objective of this study is to identify the role of SDQ in enhancing customer value. The effects of sub-dimensions of SDQ in creating customer value are explored. The validity and reliability of E-S-QUAL and Re-E-S-QUAL proposed by Zeithaml et al. [5] are tested in the context of e-learning systems.

### C. Significance of the Study

E-learning systems are a major and high cost infrastructure investment for universities. SDQ can assist educational institutions to achieve competitive advantage [6]. Learner services and support are an essential standard to the design, delivery and development of e-learning programs [7]. The benefits of e-learning include enhancing growth, profit, and competitive advantage. The indirect effect of e-learning benefits comes from enhancing customer value. Meeting customers’ requirements and providing them with new experiences and skills will motivate the users to re-use these educational services. This study investigates the role of SDQ in enhancing customer value, and provides educational institutions with recommendations that can assist in employing SDQ to support and improve customer value.

### D. Study Hypotheses

Two hypotheses were formulated: *SDQ affects customer value (H1)*; and *sub-dimensions of SDQ affect customer value (H2)*. Literature on service

delivery quality and customer value is reviewed, the methodology is detailed, and results of the analysis of the survey responses are provided. Following a discussion of the findings, a conclusion is provided with recommendations and limitations of the study.

## II. LITERATURE REVIEW

### A. *Service Delivery Quality*

Service quality has received substantial attention not only in the marketing field, but also in the information system literature. There has been interest in finding comprehensive measures to assess information system's services quality. Rockart [8] highlighted the role of service quality in information system success and considered service quality to be the most important Critical Success Factor (CSF) for information system executives [8]. Service quality is related to three kinds of customers: "external customers who have experienced the firm's services; competitors' customers whom the firm would like to make its own; and internal customers (employees) who depend on internal services to provide their own services" [9]. Service quality was absent in IS literature until the mid-1990s. Pitt et al. [10] stated that "service rarely appears in the vocabulary of the traditional system development life cycle" [10]. Since 1995, a new trend in IS has emerged. Pitt et al. [10] proposed that IS quality should be used as a criterion in evaluating information system effectiveness. Their contribution is the first empirical study to adopt service quality as a measurement to assess IS success.

Two essential reasons were behind the acceptance of SERVQUAL by researchers [11]. Firstly, SERVQUAL is a benchmarking tool which can be used to make comparisons between companies in the same industry. Second, this measurement can be employed as a diagnostic or prescriptive tool because SERVQUAL can locate and diagnose problems in the service process.

Watson et al. [12] adopted SERVQUAL to measure information service quality. The measurements have been conducted three times (in 1993, 1994, and 1995). The result of this research is that delivering information system service quality depends on action at three levels: strategic, tactical, and operational.

Zeithaml et al. [13] developed a scale called E-S-QUAL. 11 dimensions were identified as criteria to evaluate features of web sites. The dimensions were: reliability, responsiveness, access, flexibility, ease of navigation, efficiency, assurance/trust, security/ privacy, price knowledge, site aesthetics, and customization/personalization. Zeithaml et al. [5] proposed a scale to measure quality in e-tailing. This measurement has two parts. The first part, called E-S-QUAL, is used to measure the core

services and includes four dimensions: efficiency, reliability, fulfilment, and privacy. The second part of the scale is called Re-E-SERVQUAL. There are some measurements which have been developed to evaluate e-service quality. Those scales have taken different titles, for example, WebQual, SITE-QUAL, eTailQ, PIRQUAL, and e-SELFQUAL.

Holsapple and Lee-Post [14] considered service quality, system quality and information quality, as critical elements in designing e-learning systems successfully. Five indicators used to measure service quality were: promptness, responsiveness, fairness, knowledgeability, and availability. Roca et al. [15] have extended the technology acceptance model (TAM) to study e-learning continuance intention. Perceived quality (information quality, service quality, and system quality) were added to the research model. A measure of service quality has been prepared based on the studies of [16]; [10]; and [17]. Ozkan and Koseler [18] proposed a model to evaluate e-learning system success in the higher education context, namely the Hexagonal E-learning Assessment Model (HELAM). Service quality was selected as an essential construct in this model. Four subscales were employed to measure this construct: student tracking, course/instruction authorisation, course management, and knowledgeability. Adeyinka and Mutula [19] suggested a model to evaluate WebCT system success. Service quality has been specified as an important construct. The focus of service quality concerned evaluating the support delivered by the WebCT team to students. Teaching and learning quality, as well as the quality of tutors' interactions with students, were the main concerns of this variable.

### B. *Customer Value: Internal Customers*

Users are the primary evaluators of IS' outcomes because of their continued contact with these systems and their outputs. Since 1980, much research has been conducted to identify benefits received through using IT – from the users' point of view. DeLone and McLean [20] reviewed 39 previous studies to identify the individual impacts of IS. The main measures used to assess individual benefits in these studies were: information understanding, learning, accurate interoperation, information awareness, information recall, problem identification, decision effectiveness, decision quality, improved decision analysis, correctness of decisions, time to make decisions, confidence in decision, decision making participation, improved individual productivity, change in decision behavior, task performance, quality planning, individual power or influence, personal evaluation of IS, and willingness to pay for information. Most of these measurements focused on the role of IS in improving decision making and individual performance. The focus of these studies was on internal customers (managers and employees) and

how they improved their performance by using the information system's output.

### C. Customer Value: External Customers

The roots of the term "customer value" can be found in marketing literature. Zeithaml [21] was the first researcher to use this term. In 1997, Woodruff [22] identified customer value as a source of competitive advantage. The measurements of value in IS literature focuses on perceived value which is generated from using new and advanced technology. Fiore et al. [23] investigated the impact of Image Interactivity Technology (IIT) of a web site, of telepresence, and of customer value on consumer responses toward the online retailer. Two kinds of value were used to measure this factor: instrumental value and experiential value. Yang and Jolly [24] relied on marketing literature to measure consumer-perceived value in the context of mobile data service. Four kinds of customer value were employed in this study: functional, social, monetary, and emotional. Customer value is no longer limited as the central issue in the marketing field but has been extended to include IS as well. Efforts have tended to deal with this issue in order to achieve the core purpose, namely, creating, enhancing, and delivering products with a high rate of value to customers via electronic channels.

## III. RESEARCH METHODOLOGY

### A. Measurement Instrument

A questionnaire was developed to collect the data from the study sample. The items of SDQ were adopted from Parasuraman et al. [17]. The main justification to use E-S-QUAL and E-RecS-QUAL is that the validity and reliability of this instrument has been tested. SERVQUAL is the common instrument in the marketing and IS literature, and many studies adopted it. It is worth mentioning that two items to measure the contact dimension were adopted from the study of Ong and Lai [25], and the two others were selected from Parasuraman et al.'s [17] instrument. In respect to the customer value construct, different studies were employed to select the suitable items to measure this construct. The first three items were adopted from Holsapple and Lee-Post [14], and the last two items adopted from Ledden et al. [26]. The main justification of using these items is that the five items have been used in empirical studies and their validity and reliability is established. The five items focus on the two directions of students' value: academic value, and social value. Five-point Likert scales (1 strongly disagree as low and 5 strongly agree as high) were used in the instruments to measure the opinions of respondents about e-learning system success. Two more options were added to the scale: Don't know, and Not applicable.

### B. Study Sample and Data Collection

The research was conducted with students who use the e-learning system at the University of Southern Queensland (USQ). This group of stakeholders has constant contact with the e-learning system at USQ, and their opinions will provide a real picture about e-learning systems. The study is limited to USQ because studying many different institutions would be prohibitively costly and time-consuming. An instrument was prepared to collect the data from students enrolled in online courses. The survey was developed by using Survey Monkey and the links distributed to the students via Study Desk. The number of usable responses from the student sample was 720.

## IV. ANALYSIS AND FINDINGS

### A. Confirmatory Factor Analysis (CFA)

Structural Equation Modeling (SEM) was employed in this study. To achieve the study purpose, first-order CFA was conducted. The main reason to use CFA is to eliminate the weak items and reach the fit measurement model. The service delivery quality construct comprised 20 items and represented six sub-dimensions: efficiency (3 items), availability (3), fulfilment (4), privacy (3), responsiveness (3), and contact (4). The model indices at the first iteration were: CMIN/DF 5.498, GFI 0.891, AGFI 0.853, RMR 0.054, RMSEA 0.079, P 0.000. These results show that the measurement model does not fit and we needed to identify the items which have a high error variance, the parameters that have a low squared multiple correlation, and determine items with high modification indices. This stage was conducted until the model fitted. Seven iterations were undertaken using first-order CFA. At each stage of iteration one item was eliminated to improve the fit of model. After those seven iterations 13 items were yielded: efficiency (2 items), availability (2), fulfilment (3), privacy (2), responsive (2), and contact (2). The model indices after conducting the seventh iteration were: CMIN/DF 1.935, GFI 0.980, AGFI 0.963, RMR 0.017, RMSEA 0.036, P 0.000. These indicators confirm that the measurement model is an excellent fit and all the indicators are over the acceptable level. Generally, the P value should be  $> 0.05$  but it is very sensitive to sample size [27]. As the sample of this study is large (720 students) the P value can be considered acceptable in this case. The 13 items yielded from the first-order CFA were input to conduct second-order CFA. The main purpose is to check the validity of these items in measuring the SDQ construct. The result of conducting the second-order CFA were CMIN/DF 1.888, GFI 0.977, AGFI 0.964, RMR 0.020, RMSEA 0.035, P 0.000. These results are supportive of the first-order

results and provide strong evidence of the validity of this construct.

In respect to customer value, the one-factor congeneric measurement model was used. Five items were employed to measure this construct. Three iterations were undertaken to reach the fit model. The indices at the first iteration were CMIN/DF 14.531, GFI 0.958, AGFI 0.873, RMR 0.032, RMSEA 0.137, P 0.000. These results show that the model does not fit. Two other iterations were conducted to improve the model. At the second iteration an item was deleted, and at the third iteration, co-variance between two items of the customer value construct was conducted to improve the model fit. The results after undertaking these iterations were CMIN/DF 2.432, GFI 0.997, AGFI 0.971, RMR 0.007, RMSEA 0.059, P 0.040. The outputs of CFA point to the validity of items in measuring the study constructs, and these items represent the constructs adequately.

### B. Reliability and Validity

After conducting CFA, the reliability and validity of the constructs were tested. The reliability was tested using Squared Multiple Correlation (SMC) and Cronbach Alpha. The reliability was examined by using convergent validity. Table 1 shows these indicators.

TABLE I. INDICATORS OF RELIABILITY AND VALIDITY

Constructs	Items	SMC	Factor Loading	Cronbach Alpha
Efficiency	EFFI1	.622	.789	.819
	EFFI2	.772	.878	
Availability	AVA2	.765	.875	.825
	AVA3	.644	.803	
Fulfilment	FULF1	.620	.787	.759
	FULF2	.547	.740	
	FULF3	.442	.665	
Privacy	PRIV2	.556	.745	.72
	PRIV3	.571	.755	
Responsive ness	RESP2	.301	.547	.71
	RESP3	.870	.933	
Contact	CONT3	.691	.831	.822
	CONT4	.704	.839	
Customer Value	CUSV1	.502	.829	.815
	CUSV2	.379	.720	
	CUSV3	.609	.667	
	CUSV4	.521	.617	

As the recommended level of SMC is > 0.50 [28] a SMC value of 0.30 indicates an acceptable item [29]. Most of the indicators exceed 0.50, and were between 0.502 and 0.870. Three items were between 0.30 and 0.44, still within the acceptable range. Cronbach Alpha values indicated the reliability of the measurement model, and the values for this indicator were between 0.71 and .0825. The convergent validity is “a measure of the magnitude of the direct structural relationship

between an observed variable and latent construct” [29, p. 9-24]. As the recommended value to achieve convergent validity is 0.70, the result of 0.50 is an acceptable level [30]. The values of factor loading were between 0.547 and 0.933 pointing to the validity of the constructs based on this indicator. The validity is supported by the construct validity. The indices of goodness of fit measures point to construct validity. The two constructs in this study have achieved a good fit and the indices provide evidences about the validity of those constructs.

### C. Hypotheses Tests

SEM was selected to test the hypotheses. Two models of SEM have been proposed. Fig. 1 shows the first model which depends on second-order CFA to test the effect of SDQ totally on the customer value.

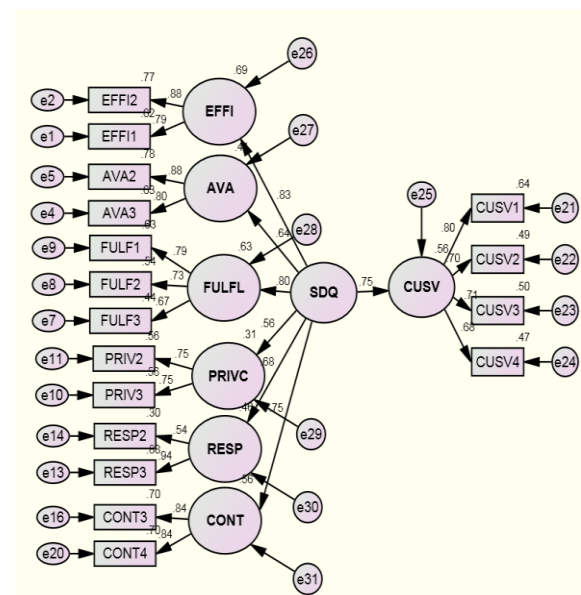


Figure 1. Model to test hypothesis H1

The model indices were CMIN/DF 2.013, GFI 0.964, AGFI 0.951, RMR 0.022, RMSEA 0.038, P 0.000. Based on these indices, the model has an excellent fit. Table II shows the regression weights of the first model.

TABLE II. FIRST MODEL REGRESSION WEIGHTS

			Estimate	S.E.	C.R.	P
EFFI	←	SDQ	.647	.036	18.130	***
AVA	←	SDQ	.447	.033	13.445	***
FULFL	←	SDQ	.453	.030	15.213	***
PRIVC	←	SDQ	.329	.030	10.836	***
RESP	←	SDQ	.557	.032	17.610	***
CONT	←	SDQ	.500	.029	17.301	***
CUSV	←	SDQ	.493	.029	17.235	***

The results of the first model run show that SDQ significantly affects customer value. The value of the critical ratio is 17.235 and it is evidence of the significant impact of this construct

as an exogenous construct in creating customer value (the endogenous construct). The critical ratios of the indicator variables of SDQ are more than 1.96 which indicates that all these sub-dimensions significantly represent the main construct (SDQ). H1, the effect of SDQ (totally) on customer value is not rejected.

Fig. 2 shows the model to test H2, the effect of each sub-dimension of SDQ on customer value. The model indices were CMIN/DF 2.062, GFI 0.968, AGFI 0.950, RMR 0.019, RMSEA 0.038, P 0.000. These indicators point to an excellent fitting model.

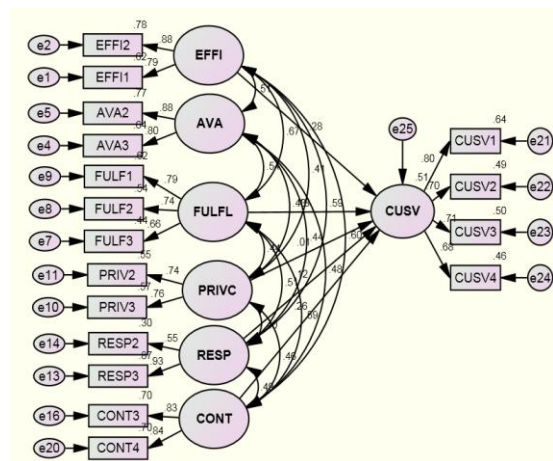


Figure 2. Model to test hypothesis H2

Table III presents the regression weights of the model constructs and variables indicators.

TABLE III. REGRESSION WEIGHTS OF SECOND MODEL

			Estimate	S.E.	C.R.	P
CUSV	←	EFFI	.237	.054	4.380	***
CUSV	←	FULFL	.202	.074	2.747	.006
CUSV	←	PRIVC	.006	.054	.114	.910
CUSV	←	RESP	.093	.040	2.340	.019
CUSV	←	CONT	.252	.055	4.621	***
CUSV	←	AVA	.024	.045	.526	.599

The results in Table III show that four sub-dimensions of SDQ significantly affect customer value: efficiency, fulfilment, responsiveness, and contact. The critical ratios of these variables are more than 1.96. However, the effects of privacy and availability dimensions on customer value were not significant. Based on the results of analysing the second model, the second hypothesis is partially supported.

## V. DISCUSSION

The current study used CFA to test the measurement model of the constructs. SDQ was measured using E-S-QUAL and Re-E-SERVQUAL. The result of the CFA supports the reliability and validity of this instrument in measuring SDQ in the e-learning system field. The

results support the SDQ construct including the six sub-dimensions in the original measurement. However, compensation is not included in this measurement model because it is not applicable in the context of e-learning systems. The measurement of customer value in this study has been established based on the two main types of value: academic value and social value. The CFA result indicates that the two types of value are significant in measuring the customer value (students) and the reliability and validity of this measurement is confirmed.

Two models based on SEM were prepared to test the hypotheses. The first model was established based on the second-order CFA. The main purpose of this model is to examine the effect of SDQ totally on the customer value. The result indicated that SDQ plays a critical role in creating customer value. To obtain more details about the effect of sub-dimensions of SDQ on customer value, the second model of SEM is offered based on first-order CFA. The empirical test of the second model concluded that there are four sub-dimensions of SDQ that significantly impact customer value: efficiency, fulfilment, responsiveness, and contact. However, there are two variables of SDQ that have no effect on the customer value construct: privacy and system availability. The same result about those two variables was found by Parasuraman et al. [17]: the effects of system availability and privacy were insignificant on perceived value and loyalty intentions. The result of the non-significant effect of privacy is supported by Wolfinbarger and Gilly [31]. In this regard, the main justification of non-significant effect of privacy on customer value in e-learning systems is that students tend to share some information about study, comments about the materials, sharing the knowledge, and invitations to other students to study in groups.

System availability is related to correct performance of the technical functions of the system [17]. This variable has a non-significant effect on customer value. The e-learning systems are not different to traditional or electronic IS and may face technical problems. The system will not be available to students when it is temporarily suspended for maintenance. The design of the e-learning systems interface (website) may affect system availability if the site is complicated and has too much content. These sites need high speed internet connection to load pages, and this aspect may be not available on some devices used to access e-learning services, e.g. mobile phones.

The analysis revealed that efficiency, fulfilment, responsiveness, and contact significantly contributed to customer value. The aspects of ease of use, accessibility, veracity of the system, the ability to exchange the information, and availability of contact channels are critical aspects

in developing students' performance and enhancing their social value from using the e-learning system.

## VI. CONCLUSION AND RECOMMENDATIONS

The main recommendation to educational institutions and organisations adopting e-learning systems is that SDQ should be evaluated. This should not be limited to one stakeholder group but include different constituents such as students, academic staff, and ICT staff. The variety of opinions in evaluating SDQ is important to provide a comprehensive and true picture about the services of e-learning systems. The investigation of factors affecting customer value in the context of e-learning systems should be adopted and extended to explore the factors impacting the organisational and societal value as well.

The contribution of this study to knowledge is in providing evidence about the role of e-learning SDQ in enhancing customer value. It supports the reliability and validity of E-S-QUAL and Re-E-SERVQUAL. Recommendations on how to improve service delivery quality and identification of the important factors which affect creating and enhancing customer value have been derived from the study.

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