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## A model beyond generic quality models for academic libraries

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## **A model beyond generic quality models for academic libraries**

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### **Abstract**

A compelling argument raised by Bolton and Oliver, states that only customers' assessment of continuously provided services, which may depend on performance-only evaluation, deserves attention. As libraries are services provided continuously and considered in general to be a public service, it is important to research this issue. Thus this paper discusses four research problems based on quality domains, overall customer satisfaction, quality paradigm and the causality in the area of academic libraries in Sri Lanka. The paper concludes that the overall customer satisfaction is related to both satisfaction ratings in the form of gap scores and performance-only scores of quality domains, although the relationship between overall satisfaction and quality domains based on gap scores was weak, indicating statistical non-significance. The performance-only paradigm was found to be a statistically better paradigm, which produced significantly better predictors of overall customer satisfaction than the disconfirmation paradigm. Thus, all individual service quality domains, except Web services, were significant predictors of overall customer satisfaction in libraries. The study produced a final model based on the performance-only paradigm, with a linear relationship between customer satisfaction and service quality constructs in university libraries in Sri Lanka.

### **THE PROBLEM**

There is a consensus among service marketing researchers on the causal sequence/order of the concepts of customer satisfaction and service quality. Through conceptual improvement and empirical findings of past studies, most researchers have concurred on the fact that quality judgments cause satisfaction, leading to the finding on service quality being the antecedent of customer satisfaction. The formation of satisfaction in relation to service quality is generally based on two significant theories identified in the literature—that is, performance-only and expectancy disconfirmation. Accordingly, it recognised two dominant theoretical paradigms, disconfirmation and performance-only, which can be duly used for modelling customer satisfaction through the service quality perspective in organisations, enabling them to perform possible customer-led service quality evaluations. However, a compelling argument raised by Bolton and Oliver (1989), cited in Bolton in Drew (1991),

states that only customers' assessment of continuously provided services, which may depend on performance-only evaluation, deserves attention. As libraries are services provided continuously and considered in general to be a public service, it is important to research this issue. Some studies have also proved the superiority of performance-only measures over disconfirmation scores in terms of predictive power and ability to explain the variance in overall perceptions of service quality (Cronin & Taylor, 1992).

There are two popular service quality models that are being used worldwide to measure customer satisfaction in terms of service quality. These are SERVQUAL and SURVPREF. The SERVQUAL model was developed by Parasuraman, Zeithaml and Berry (1988), based on the disconfirmation paradigm referred to as the "gap model," underscoring the expectancy disconfirmation theory. SURVPREF, developed by Cronin and Taylor (1992), introduce a framework based upon performance-only scores derived from the performance theory. Since the 1990s, many researchers have tried to use SERVQUAL to measure library service quality in different settings, but failed to produce reliable and valid results. Thus, LibQUAL, which is a modified version of SERVQUAL, was designed by library and information science researchers on the basis of the underlying methodology of SERVQUAL based on the same disconfirmation paradigm.

Despite the unprecedented support for the use of SERVQUAL, its methodological approach has been widely criticised, and some researchers agree that the performance-only paradigm is superior to the disconfirmation paradigm (Cronin & Taylor, 1992). It generates mixed results and raises the question as to which paradigm is better suited for modelling/measuring customer satisfaction in connection with service quality. On the other hand, reviews of the existing literature on customer satisfaction and service quality suggest that the current understanding of the relationship between customer satisfaction and service quality is problematic (Taylor & Baker, 1994, cited in Jamal & Naser, 2002). Even if different models have been developed and extended to provide better measurements of service quality and customer satisfaction, a consensus on the relationship between these two constructs cannot yet be found. Although many researchers have proved the linear relationship between these two constructs (Andreassen, 2000; Cronin and Taylor, 1992), some researchers have found a non-linear relationship between customer satisfaction and service quality (Ting 2004). This conflicting empirical evidence highlights the need for research on the causality between these two constructs. In reviewing the literature, the following research questions were posed.

## **Research questions**

- Do individual quality attributes predict their respective quality domains?
- If individual quality attributes predict their respective quality domains, do these quality domains predict overall customer satisfaction?
- What is the best paradigm which explains the correct dynamism of customer satisfaction in relation to service quality in academic libraries in Sri Lanka?
- What is the causality between service quality and customer satisfaction in the area of academic libraries.

## **METHODS AND MATERIALS**

The study was conducted using four key steps as mentioned below.

- Step One: Developing provisional models based on the identified attributes and domains.
- Step Two: Conducting a survey to gather data on user satisfaction, service quality, socio-demographic and situational attributes.
- Step Three: Testing the provisional models with standard statistical techniques.
- Step Four: Identification of the best parsimony model to predict user satisfaction from a service quality perspective, in the context of university libraries in Sri Lanka.

### **Sample and sampling**

The students in the undergraduate and postgraduate programmes and academic staff members in the fields of humanities and social sciences in the Faculties of Arts of two universities located in the Colombo metropolitan area, the University of Colombo and University of Sri Jayewardenepura, and of two other universities in remote areas, the University of Ruhuna and Rajarata University, were used as the sample population. The underlying criterion for selecting these universities was that they are a fair representation of all fifteen universities in Sri Lanka. As it is generally believed by the public that libraries in the universities in Colombo have better tangible and intangible resources compared to more remote university libraries in Sri Lanka, the study selected two major universities in Colombo, of which one was the oldest in Sri Lanka, and two universities from remote areas as being reasonably representative of the whole system of universities in the country. The study population and selected sample is depicted in Table 1.

**Table 1: Sample population of the study**

<b>University</b>	<b>Faculty</b>	<b>Customer segment</b>	<b>No. of total subjects</b>	<b>Percentage (%)</b>
University of Colombo	Arts	Undergraduates	1,907 (322)*	17
		Postgraduates	471 (214)*	45
		Academic staff	152 (113)*	74
University of Sri Jayewardenepura	Arts	Undergraduates	1,518 (310)*	20
		Postgraduates	135 (103)*	76
		Academic staff	152 (113)*	74
University of Ruhuna	Arts	Undergraduates	1,409 (306)*	22
		Postgraduates	3 (3)*	100
		Academic staff	99 (80) *	81
Rajarata University of Sri Lanka	Arts	Undergraduates	733 (254)*	35
		Postgraduates	0	0
		Academic staff	22 (22)*	100
<b>Total</b>			<b>6,601 (1,840)**</b>	<b>28</b>

\* Number of subjects from this stratum selected for the sample of study

\*\* Size of the sample

The sample size was determined from the chart of pre-defined sample sizes developed by Krejcie & Morgan (1970). Since the population was 6,601 subjects, the sample size was 1,840 subjects. The following inclusion criteria for the subjects to be included in the sample were used.

- a) Subject had to be a registered customer of the relevant library;
- b) Subjects in the undergraduate students category should not be first year students but necessarily be a year from 2<sup>nd</sup> to 5<sup>th</sup>;
- c) Individual subjects should declare that he/she is a regular library customer; and
- d) Subjects in the academic staff category should be permanent university teachers with a minimum of one year's experience.

## Instrumentation

A structured questionnaire was used for the study that consisted of three sections, to elicit data on personal and situational information, customer perceptions, customer expectations, overall service quality and on data related to the direct evaluation of identified service quality domains. In particularly considering the Validity and Practicability of this measurement (Cooper & Schindler, 2006), a specialised aspect of the questionnaire development process was chosen as a measurement format (DeVellis, 2003; Hinkin, Tracey & Enz, 1997; Wegener & Fabrigar, 2004). On the outset, it determined the clarity of instructions and questions, repetitiveness and sensitivity of questions, coherence of format and layout, and appropriate length. Since pre-testing of the questionnaires is strongly recommended to detect deficiencies in design, administration and wording of questions (Oppenheim, 1992; Robson, 1993), it was evaluated for content and face validity by a panel of experts which consisted of three professional university librarians in Sri Lanka with more than fifteen years experience and professional qualifications at the master's level and above. The questionnaire was also tested by the same panel of experts to confirm the expectations regarding the psychometric properties of the measure (Hinkin, Tracey & Enz, 1997). The sample of undergraduates from the Faculties of Arts of the selected universities was invited to participate in the study. Postgraduate students of the same faculty, drawn from each postgraduate programme, were also invited to participate. Questionnaires to the academic staff members of the Faculties of Arts were personally distributed, and the staff were requested to return the duly completed questionnaires within ten days' time.

## **ANALYSIS**

### **Profile of the responses**

A total of 1,840 questionnaires were distributed among the respondents of four universities, and out of these, 1,298 responses were received. Out of these responses, 1,181 were usable for the analysis, and 117 were unusable. Therefore, the overall gross response rate to the survey was 71%, but with the elimination of the unusable questionnaires, the usable response rate dropped to 64%. The sample size of the present study compared to the sample sizes of prior studies seemed highly satisfactory, as its usable response rate is 64% (Sahu, 2007; Filiz, 2007; Sinyenyeko-Sayo, 2007; Woo, 2005).

### **Profile of the respondents**

At the initial phase of the survey, to form an idea about the constitution of the respondent sample, profiles of the respondents involved in the study were developed. These profiles were formed using information available regarding the socio-demographic attributes of the

sample that was relevant to the service quality perceptions of the selected person, as opposed to perceptions on satisfaction.

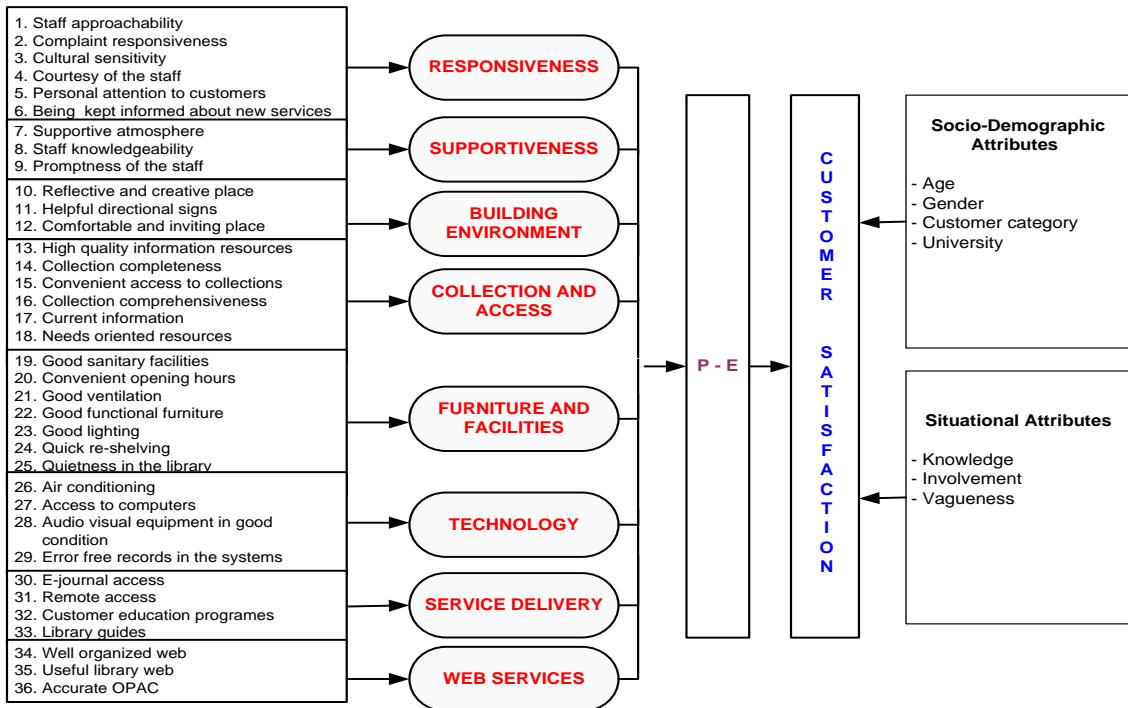
Of the total number of respondents, 50.8% were male, while 49.1% were female, and 0.1% contained missing values. In terms of user category, 66% of them were undergraduate students, 10.1% were postgraduate students, and 23.9% were academic staff members. The majority of the respondents were from the University of Sri Jayewardenepura (33%), even though the University of Colombo had the largest population size. On the basis of regularity of library visits, 57% of them use the library every day, while 35.5% use the library 1-3 days a week. There were no non-library customers among the respondents in the study.

On the basis of the outcome mentioned above, one could infer that the characteristic of relatively high use of the library was indicative of the customers' familiarity and/or knowledgeability with the services, and this characteristic was therefore considered in this study as indicative of sufficient capability among those respondents to evaluate the service quality of the library. The majority of the respondents use the library for the purpose of obtaining information (71%). The demographic characteristics of the sample appear highly consistent with the population of universities in Sri Lanka and comparatively close to the overall characteristics depicted in university statistics (University Grants Commission Annual Report 2008).

### **Development of provisional models**

The first part of this research project was published in the Journal of Academic Librarianship in 2015 and it identified the quality attributes and domains for further study. According to the attributes and domains identified by the exploratory study (Jayasundara, 2015), provisional models were developed based on the expectancy disconfirmation (gap) paradigm and performance-only paradigm, as illustrated in Models I, and II in Figures 1 and 2 respectively. The purpose for developing the provisional model was to inquire and ascertain which of the models chosen presented the highest correlation with customer satisfaction assessments of library services in the university sector in Sri Lanka.

**Figure I: Provisional model I based on disconfirmation paradigm**



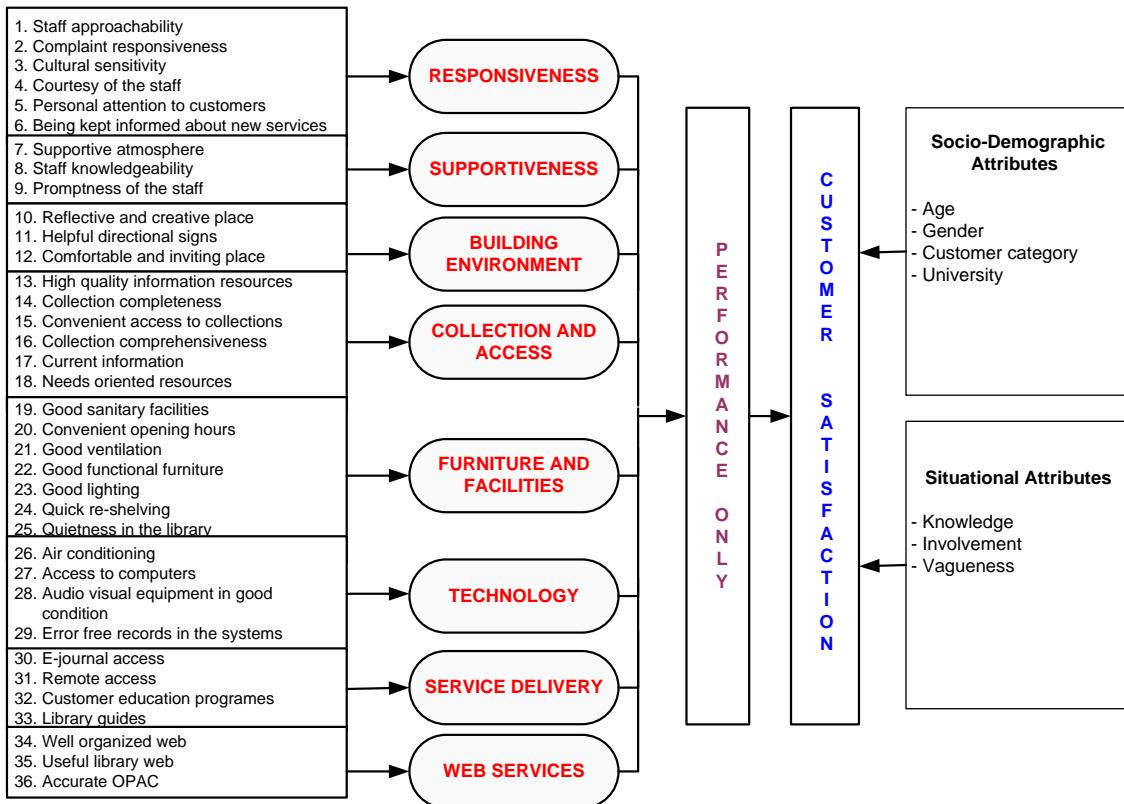
P-E = Performance – Expectation

Provisional Models I illustrate the disconfirmation (gap) theory as proposed by Gronroos (1992) and Parasuraman, Zeithaml and Berry (1985) that supports the notion that customers perceive service quality as a comparison between their perception on what a service should offer and their perception on the actual performance of the service. This model interprets the definition of a perceived service quality of the library as the difference between customers' expectations of library services and their perceptions of the actual performance of the library service quality. Mathematically, the equation is expressed as

$$SQ = (P_i - E_i),$$

where  $i$  is a service quality attribute and the sum is over  $k$  library service quality attributes for each quality domain.  $SQ$  is service quality,  $P_i$  is performance of a given attribute, and  $E_i$  is the customers' expectation of the same attribute.

**Figure 2: Provisional model II based on performance-only paradigm**



Provisional Model II illustrates the performance-only theory as proposed by Cronin and Taylor (1992), which state that customer satisfaction is a function of performance of service quality attributes. Mathematically, it is

$$SQ = f(P),$$

where SQ is service quality, and P is the performance of given quality attributes.

To identify the best parsimonious model, the constructs in the provisional models were operationalised in the following manner.

### Customer satisfaction

Most of the research studies in the field of customer satisfaction have utilised the multi-item scales more often, instead of the single items scales, to better represent customer satisfaction, which is a complex phenomenon (Kerlinger, 1973; Churchill, 1979; Gerbing & Anderson, 1988; Westbrook & Oliver, 1981). This study employed the multi-item scale to measure the construct, following the successful use of the multi-item scale by a large

number of studies to devise a composite attribute to indicate overall customer satisfaction (Chin *et al.*, 2003). For this purpose, two questions were used, as described below.

- a) *Overall, how would you rate your satisfaction with the library service of your university?*
  
- b) *How would you rate your satisfaction with the library service of your university in terms of its impact on your teaching and/or learning?*

The composite attribute that resulted from the amalgamation of these two questions was named “overall customer satisfaction”, which more correctly represented the construct of customer satisfaction in university libraries.

### **Service quality**

As depicted in figure 1 and 2, the exploratory study carried out in the first stage of the study identified 36 quality attributes that may impact customer satisfaction (Jayasundara, 2015). These attributes were then narrowed down to 8 quality categories, by clustering them into eight quality domains. Thus, the research used both quality attributes and/or domains for the analysis to determine the best model for predicting overall customer satisfaction.

### **Situational attributes**

The study employed customer experience, involvement and vagueness as situational attributes that may have significantly impacted the formation of customer satisfaction in university libraries. Previous research measured experience in two different ways—either as knowledge of customers, or as familiarity of customers of a service or product (Patterson, 2000). Therefore, it is reasonable to hypothesise that the longer a customer has used library services, the more experienced he or she will be about library services. While the knowledge regarding library service is referred to as the customers’ perceptions of how much they know about this particular service (Scribner & Weun, 2002), familiarity is considered to refer to the service-related experience of the customer (Alba & Hutchinson, 1987). Thus, it can be argued that knowledge or familiarity basically denotes experience. However, the researcher used knowledge of customers in this study based on the premise that customers cannot be familiar with a service if they do not know about it. To measure the knowledge of customers, the statement given below was used to rate the statements made by the respondents.

*I feel very knowledgeable about library services.*

Involvement refers to the essentiality of the service. Thus, it was measured by a statement in which respondents could select an option ranging from 1 - 5. The statement used was:

*Library service is an essential service in my daily academic life.*

Vagueness of the evaluation may be interpreted to refer to the ease or difficulty of evaluating the service. Thus, the researcher used ease as the positive concept for determining the vagueness of the service. The question used for this was a statement to which the respondents had the choice of selecting an option ranging from 1 = strongly disagree to 5 = strongly agree on the Likert scale. The statement was:

*It is very easy for me to evaluate service quality of my university library.*

### **Socio-demographic attributes**

Member category, university, age and gender were used as socio-demographic attributes.

### **Provisional model analysis**

A model analysis was conducted with two multivariate statistical analyses to build regression models to represent the provisional models—that is, multiple linear regression and binomial logistic regression techniques. These techniques were used to determine the strength of the relationships between the independent and dependent attributes. Multiple linear regression analysis (MLRA) was used to establish the linear relationship between independent attributes and the dependent attribute. An automated stepwise regression selection procedure was applied to identify the best model. Binomial logistic regression analysis (BLRA) were fitted into a backward stepwise method, and the results of each analysis were examined separately to ascertain the best model for predicting customer satisfaction, assuming non-linear functionality between the constructs of customer satisfaction and service quality.

**Question:** Do gap scores/performance-only scores of quality attributes predict their respective quality domains?

This question was addressed through the MLRA and BLRA techniques.

### **MLRA model analysis**

The stepwise selection procedures were used to identify the best regression model to predict customer satisfaction (Hutcheson and Sofroniou, 1999; Brace, Kemp & Snelgar, 2006). It ends up with the smallest set of predictor attributes in the final model that produces the most parsimonious model. An alpha value of 0.1 was used as the entry cut-off value for attribute selections.

To measure the predictive power of the regression models, the coefficient of determination ( $R^2$ ) was used as an estimate. The  $R^2$  estimate describes the percentage of the total variance of the dependent attribute about its mean, which is “explained” or “accounted for” by the independent attribute (Lewis-Beck, 1993). A value closer to 1 demonstrates the better fit of the model because if  $R^2$  is 1, then the regression model accounts for all the variations in the dependent attribute. Hair *et al.* (1998) point out that if the regression model is properly applied and estimated, it can be assumed that the higher the value of  $R^2$ , the greater the explanatory power of the regression equation, and the better the prediction of the dependent attribute. However, there is no perfect statistical argument for deciding what level of  $R^2$  is appropriate (Uncles & Page, 1998). Thus, the model with the highest  $R^2$  value can be used as the best model with predictive power. However, since  $R^2$  tends to overestimate the success of the model when applied to the real world, an adjusted  $R^2$  value was calculated. Adjusted  $R^2$  values generally take into account the number of attributes and the size of the sample, too. Thus, it is a less biased measure, compared to  $R^2$ , for the variance explained by the model; therefore, adjusted  $R^2$  was used in this study for the interpretation of the explanatory predictability of the models.

Sixteen multiple linear regression tests were used to measure the strengths of the attributes and domains, based on the performance-only paradigm, and another set of eight multiple linear regression tests was used to measure the strengths of the attributes and respective domains, based on the disconfirmation paradigm (gap).

**Table 2: MLRA model comparison at domain level – provisional model I and model II**

Domain	Quality Attribute	Provisional Model I (Beta)	F & Adjusted $R^2$	Provisional Model II (Beta)	F & Adjusted $R^2$
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Responsiveness	Staff approachability	-.158*	F= 17.778, p<0.001  Adjusted  $R^2=0.061$	-.235*	F=38.556, p<0.001  Adjusted  $R^2=0.087$
	Complaint responsiveness	n.s.		n.s	
	Cultural sensitivity	-.093*		-.085*	
	Courtesy of the staff	n.s		n.s	
	Personal attention to customers	.073*		n.s	
	Being informed about new services	.114*		.107*	
Supportiveness	Supportive atmosphere	.148*	F= 11.994, p<0.001  Adjusted  $R^2=0.027$	.173*	F=19.322, p<0.001  Adjusted  $R^2=0.045$
	Staff knowledgeability	.095*		.134*	
	Promptness of the staff	-.074*		-.100*	
Building environment	Reflective and creative place	n.s.	98.580, p<0.001  Adjusted  $R^2=0.145$	.314*	F=357.088 , p<0.001  Adjusted  $R^2=0.475$
	Helpful directional signs	-.090*		.447*	
	Comfortable and inviting place	.443*		.424*	
Collection and access	High quality information resources	n.s.	F = 64.285, p<0.001  Adjusted  $R^2= 0.220$	.153*	F = 88.090, p<0.001  Adjusted  $R^2= 0.307$
	Collection completeness	.070*		.174*	
	Convenient access to collections	.206*		.240*	
	Collection comprehensiveness	.140*		.204*	
	Current information	.232*		.240*	
	Needs-oriented resources	.247*		.237*	

Furniture and facilities	Good sanitary facilities	n.s.	F=107.001 , p<0.001 Adjusted $R^2 = 0.371$	n.s.	F=893.769 , p<0.001 Adjusted $R^2 = 0.752$
	Convenient opening hours	.051*		.279*	
	Good ventilation	.327*		.523*	
	Good functional furniture	.254*		.397*	
	Good lighting	.205*		.215*	
	Quick reshelfing	.181*		n.s	
	Quietness in the library	.176*		n.s	
Technology	Air-conditioning	.328*	F=95.268, p<0.001 Adjusted $R^2 = 0.197$	.287*	F=127.946 , p<0.001 Adjusted $R^2 = 0.304$
	Access to computers	.306*		.301*	
	Audiovisual equipment in good condition	n.s		.143*	
	Error-free records in the systems	.136*		.183*	
Service delivery	E-journal access	.336*	F=86.969; p<0.001 Adjusted $R^2 = 0.234$	.350*	F=200.783 , p<0.001 Adjusted $R^2 = 0.413$
	Remote access	.189*		.280*	
	Customer education programmes	.086*		.220*	
	Library guides	.257*		.259*	
Web services	Well-organised Web site	n.s	F=189.006 , p<0.001 Adjusted $R^2 = 0.143$	-.079*	F=360.770 , p<0.001 Adjusted $R^2 = 0.481$
	Useful library Web site	.379*		.608*	
	Accurate OPAC	n.s		.328*	

\*p<0.05

n.s. = Not significant

Gap scores indicated in Provisional Model I found four quality attributes in the responsiveness domain to be significant predictors of satisfaction with responsiveness in the library. However, the regression model based on performance-only scores (Model II) found

only three attributes to be significant with responsiveness. Clearly, the strongest predictor of both regression models was being informed about new services (gap: beta=0.114, performance-only: beta=0.107). When the predictability of both models as reported by the adjusted  $R^2$  was compared, the regression model based on performance-only scores in Model II and depicted in Figure 2 was found to be the best ( $R^2=0.087$ ) in the domain of responsiveness. The regression model based on gap scores was weaker than the model based on the performance-only paradigm because the attributes of this gap model accounted for only 6% of the variance compared to the variance of performance-only model accounted for (9%).

The second quality domain is supportiveness. All three attributes were selected by both regression models as significant predictors. Both regression models produced supportive atmosphere as the strongest predictor (gap: beta=0.148, performance-only: beta=0.173). When both models were compared, it was found that the regression model-based on performance-only scores accounted for 4.5% of the variance associated with supportiveness satisfaction, as reported by the adjusted  $R^2$  of 0.045, which was higher than the variance produced by the regression model based on gap scores  $R^2=0.027$ . Thus, the performance-only regression model in Model II and depicted in Figure 6.7 was found to be superior when compared to Model I, which illustrates the disconfirmation (gap) theory.

Two of the three building environment attributes were significant in the regression model, based on gap scores, and all three were significant predictors of the performance-only model. This regression model depicted in Model II in Figure 2 accounted for over 47% of the variance ( $R^2=0.475$ ) associated with the building environment domain, which was prominent in both models.

All predictor attributes were significant in the regression model based on performance-only scores associated with the collection and access domain, and the corresponding gap model indicated only five predictors in the final regression model, as demonstrated in Table 2. When both models were compared, it became apparent that the predictability of the regression model based on performance-only scores was superior ( $R^2=0.307$ ) to the gap model ( $R^2=0.220$ ) scores.

The next quality domain of furniture and facilities revealed that four of the seven attributes were significant in the regression model based on performance-only scores within the domain. However, the performance-only model was not able to outperform the gap model in relation to the number of attributes selected by the model. Three quality attributes were

omitted from the final regression model. However, both models indicate that good ventilation is the most powerful predictor in relation to customer satisfaction towards furniture and facilities in libraries. Nevertheless, the regression model on performance-only scores based on Model II accounted for over 75% of the variance associated with the satisfaction of this domain, which is almost two times higher than the gap model variance (37 %).

Satisfaction with technology revealed that all attributes in the performance-only regression model were significant predictors, but only three items were significant in the gap model. When considering the predictability of both models, it was found, as reported by adjusted  $R^2$  statistics, that the regression model based on performance-only scores was the best, as it accounted for over 30% of variance the associated with technology, compared to the model on gap scores (20%).

Satisfaction with service delivery in both regression models showed that all attributes were significant predictors. However, in considering the predictability of both models, it was apparent that the performance-only model was the best because it accounted for over 41% of the variance associated with the satisfaction with the service delivery domain ( $R^2=0.413$ ) over the gap model (23%).

These regression models also analysed the strength of the quality attributes pertaining to satisfaction with Web services in libraries. One of the three quality attributes was significant in the gap model, while all three were significant in the performance-only model. The strongest predictor of both models was useful library Web sites (gap:  $\beta=0.379$ , performance-only:  $\beta=0.608$ ). The regression model on performance-only scores was superior compared to the gap model, as it accounted for over 48% of the variance associated with the satisfaction with Web services in libraries ( $R^2=0.481$ ).

In conclusion, performance-only models exhibited much stronger predictability than the gap models.

**Question:** If performance-only/gap scores of individual quality attributes predict their respective quality domains, do these quality domains predict overall customer satisfaction?

The regression models derived by MLRA to model customer satisfaction with quality domains are depicted in Table 3. As the gap scores of individual quality attributes were able to predict their corresponding quality domains in the MLRA, the analysis was continued to

uncover the quality domains, which can be significant predictors of overall customer satisfaction using the same statistical technique.

**Table 3: MLRA model comparison at overall satisfaction level – provisional models I and II**

Quality Attribute	Provisional Model I (Beta)	Provisional Model II (Beta)
Responsiveness	n.s.	.054*
Supportiveness	.259*	.353*
Building environment	-.056*	.204*
Collection and access	.228*	.357*
Furniture and facilities	.330*	.359*
Technology	n.s.	.161*
Service delivery	.174*	.257*
Web services	n.s.	n.s.
	F= 94.669, p<0.001 Adjusted R <sup>2</sup> = 0.295	F=219.169 ;p<0.001 Adjusted R <sup>2</sup> = 0.564

\*p<0.05

n.s. = Not significant

The overall F-test for the final regression model based on provisional model I was found to be statistically significant ( $F= 94.669$ ) at  $p<0.001$ . The adjusted  $R^2$  value was 0.295, which indicates that the predictor attributes—collection, furniture, supportiveness, service delivery and building environment—explained only 30% of the variation in overall customer satisfaction. The regression model derived from Provisional model II, presents only seven attributes, and the attribute “Web services” was excluded due to its poor level of significance. The adjusted  $R^2$  indicates how much of the variance in the satisfaction is accounted for in the population from which the sample was derived.  $R^2 = 0.564$  indicates that the model, which accounted for seven attributes out of the eight tested, is the most parsimonious model accounting for over 56% of the variance in the satisfaction outcome. The p-value ( $p<0.001$ ) also indicates that the regression model is significant. All beta values, except responsiveness, indicate a strong influence on overall customer satisfaction.

Comparison of the two provisional models, depicted in Table 2, indicated that predicting overall customer satisfaction with library services can be correctly measured by the performance-only paradigm because this model accounts for higher predictability, as

reported by the adjusted R<sup>2</sup> value of 0.564. This model explained over 56% of the variance associated with overall customer satisfaction, which is significantly higher than the gap model, which accounted for only 30% of the variance. From a close study of the MLRA analyses, it was concluded that the performance-only paradigm, depicted in Provisional Model II, was the best model for predicting overall customer satisfaction through quality attributes and quality domains, based on multiple linear regression analysis.

### **BLRA model analysis**

At the outset, Provisional Models I and II derived through BLRA were compared to determine the best model based on the gap scores or performance-only scores at the domain level. Then, the models were compared based on the same gap or performance-only paradigms to determine the best model at the overall customer satisfaction level.

A comparison of Models I and II was conducted through BLRA analysis. The following table shows the results of the comparison. The backward stepwise logistic regression technique utilised in this study was to determine the best predictive models. Cox and Snell R<sup>2</sup> were employed to measure the predictive power of the model, which can vary from 0 to 1. A value closer to 1 denotes higher predictability. Total correctness was also used to measure the predictive power of the models. In this case, it measures the correctness of classification, based on predictive and observed values. In a perfect model, the correctness should be 100%. BLRA was performed to measure the strengths of associations between quality attributes and the respective quality domains. Sixteen logistic regression models were developed to examine the differences between gap models and performance-only models.

**Table 4: BLRA model comparison at domain level – provisional models I and II**

Domain	Quality Attribute	Provisional Model I Exp(B)	H&L, C&S and Correctness	Provisional Model II Exp(B)	H&L, C&S and Correctness
Responsiveness	Staff approachability	.672*	H&L test: $X^2=14.355$ , P=0.073 C&S $R^2=.073$ Correctness:	.542*	H&L test: $X^2=11.143$ , P=0.083 C&S $R^2=.058$ Correctness: 56.4%
	Complaint responsiveness	1.303*		n.s.	
	Cultural sensitivity	.722*		n.s.	

	Courtesy of the staff	n.s.	78%	n.s.	
	Personal attention to customers	n.s.		n.s.	
	Being informed about new services	1.321*		1.159**	
Supportiveness	Supportive atmosphere	n.s.	N/A	1.360*	H&L Test: $X^2=6.065$ , P=0.532 C&S $R^2=.031$ Correctness:83.5%
	Staff knowledgeability	n.s.		1.415*	
	Promptness of the staff	n.s.		.773**	
Building environment	Reflective and creative place	1.590*	H&L test: $v=16.776$ , P=0.033 C&S $R^2=.083$ Correctness: 73.2%	8.833*	H&L test: $X^2=183.408$ , P=0.000 C&S $R^2=.236$ Correctness: 97.8%
	Helpful directional signs	1.262*		7.369*	
	Comfortable and inviting place	n.s.		7.169*	
Collection and access	High quality information resources	n.s.	H&L test: $X^2=23.977$ , P=0.002 C&S $R^2=.205$ ; Correctness: 71.7%	n.s.	H&L test: $X^2=19.927$ , P=0.05 C&S $R^2=.017$ Correctness: 98.3%
	Collection completeness	1.230*		1.919*	
	Convenient access to collections	1.606*		n.s.	
	Collection comprehensiveness	1.323*		1.763*	
	Current information	1.551*		1.941*	
	Needs-oriented resources	1.449*		n.s.	
Furniture and facilities	Good sanitary facilities	1.164*	H&L test: $X^2=15.814$ , P=0.005 C&S $R^2=.273$ Correctness:	n.s.	H&L test: $X^2=3.997$ , P=0.857 C&S $R^2=.300$ Correctness:97.6%
	Convenient opening hours	n.s.		13.863*	
	Good ventilation	1.516*		8.652*	

	Good functional furniture	1.401*	72.7%	14.196*	
	Good lighting	1.406*		3.933*	
	Quick reshelving	1.606*		n.s.	
	Quietness in the library	1.565*		n.s.	
Technology	Air-conditioning	n.s.	H&L test: $X^2=4.095$ , P=0.664 C&S R <sup>2</sup> =.026 Correctness: 69.1%	7.509*	H&L test: $X^2= 0.042$ , P=1.000 C&S R <sup>2</sup> =.025 Correctness: 99.5%
	Access to computers	n.s.		9.192*	
	Audiovisual equipment in good condition	1.157*		5.675*	
	Error-free records in the systems	.782*		n.s.	
Service delivery	E-journal access	1.539*	H&L test: $X^2=14.312$ ; p=0.074 C&S R <sup>2</sup> =.085 Correctness: 72.5%	2.115*	H&L test: $X^2=44.850$ ; p=0.000 C&S R <sup>2</sup> =.134 Correctness: 92.9%
	Remote access	1.125*		1.768*	
	Customer education programmes	n.s.		2.169*	
	Library guides	1.438*		2.117*	
Web services	Well-organised Web site	n.s.	H&L test: $X^2=7.418$ ; p=0.492 C&S R <sup>2</sup> =.037 Correctness: 94%	.709*	H&L test: $X^2=47.892$ ; p=0.000 C&S R <sup>2</sup> =.120 Correctness: 94.9%
	Useful library Web site	1.656*		2.696*	
	Accurate OPAC	1.417*		4.839*	

n.s. = Not significant

\*p<0.05

Four of the six attributes in the responsiveness domain were significant predictors in the regression model based on gap scores, while only two attributes were significant in the regression model based on performance-only scores. The strongest predictor of both models was being informed about new services. However, in comparing the Hosmer and Lemeshow test  $\chi^2$  statistics, both models were not significant (gap:  $p=0.073$ ; performance-only:  $p=0.083$ ).

The regression model pertaining to gap scores in relation to the supportiveness domain did not produce any single significant predictor, and the regression performance-only model produced all predictors as significant factors. However, the overall fitness of the performance-only model was also poor, as reported by the Hosmer and Lemeshow test  $\chi^2$  ( $p=0.532$ ). Thus, both models did not predict satisfaction with supportiveness in libraries.

The next quality domain was building and environment, all attributes of which were significant in the regression model on performance-only scores. In the gap model, however, the comfortable and inviting place attribute was dropped, indicating that it was not significant. Both regression models showed the required model fitness, but the performance-only model produced higher correctness of the predictability (98%) and Cox and Snell  $R^2$  statistics (0.24).

The collection and access domain revealed that all attributes were significant, except high quality information resources, in the regression model based on gap scores. However, three attributes were excluded from the performance-only model due to its insignificance: high quality information resources, convenient access to collection, and needs-oriented resources. The overall fitness of both regression models was good, as reported by the Hosmer and Lemeshow test ( $\chi^2=23.977$ ,  $P=0.002$ ;  $\chi^2=19.927$ ,  $p=0.05$ ), except total correctness. The Cox and Snell  $R^2$  and the number of significant attributes in the gap model were higher than the performance-only model. Thus, it can be concluded that the gap model is the best compared to the performance-only regression model in the domain of collection and access.

In furniture and facilities, the regression model on gap scores showed a significant overall goodness of fit ( $\chi^2=15.814$ ,  $p=0.005$ ), while the performance-only model did not explain a significant model fitness ( $\chi^2=3.997$ ,  $p=0.857$ ). It also presented all predictor attributes, except convenient opening hours, as significant. Thus, it can be concluded that the gap model is best for predicting the domain of furniture and facilities.

In the technology domain, both regression models were unable to demonstrate the required overall model fitness (gap: Hosmer and Lemeshow Test:  $X^2=4.095$ ,  $p=0.664$ ; performance-only: Hosmer and Lemeshow Test:  $X^2= 0.042$ ,  $p=1.000$ ).

Regarding satisfaction with service delivery, the performance-only regression model revealed that the final model was significant ( $X^2=44.850$ ;  $p=0.000$ ), with a higher total percentage of correctness (92.9%). However, the model on gap scores was unable to produce a significant overall model fitness ( $X^2=14.312$ ;  $p=0.074$ ). Thus, the performance-only model was the most optimal for this domain.

The Web services domain was also the same as the service delivery domain. The performance-only regression model was the sole model that produced higher overall model fitness ( $X^2=47.892$ ) at  $p<0.001$ , and it also engendered higher correctness at 94.9%. It can therefore be concluded that the performance-only model is the best for the predictability of satisfaction with Web services in libraries.

In summary, the attributes pertaining to the following domains were able to predict their respective domains well, and the best corresponding paradigm used to predict the domain is also indicated below by arrow signs.

Responsiveness	→	Performance-only
Supportiveness	→	None
Building environment	→	Performance-only
Collection and access	→	Gap
Furniture and facilities	→	Gap
Technology	→	Performance-only
Service delivery	→	Performance-only
Web services	→	Performance-only

Since five domains out of the eight can be correctly predicted by their individual quality attributes in the performance-only paradigm, it can be concluded that BLRA has also revealed that the performance-only paradigm is the best for higher predictability of customer satisfaction and service quality. However, this does not imply that all quality domains can be predicted by the performance-only paradigm because the attributes of collection and access, furniture and facilities, and supportiveness did not correctly predict the respective quality domains by this paradigm.

### **Comparison of the measure of customer satisfaction with quality domains**

Since the individual attributes were not reasonably able to predict their respective quality domains, only the significant domains were used to model overall customer satisfaction, as indicated in the following table. The summary of statistics is indicated in Table 5.

**Table 5: BLRA model comparison at overall customer satisfaction level – provisional models I and II**

Quality Domain	Provisional Model I Exp(B)	Provisional Model II Exp(B)
Responsiveness	Not used	Not used
Supportiveness	Not used	Not used
Building environment	2.086*	n.s.
Collection and access	n.s.	1.949*
Furniture and facilities	2.248*	Not used
Technology	Not used	Not used.
Service delivery	Not used	2.232*
Web services	Not used	3.434*
	Hosmer and Lemeshow test: $X^2= 8.013$ , $p=0.331$ Cox and Snell $R^2=.197$ Correctness: 75.8%	Hosmer and Lemeshow test: $X^2= 3.868$ , $p=0.795$ Cox and Snell $R^2=.164$ Correctness: 73%

\* $p<0.05$

This comparison gives measurements of the relationship between overall customer satisfaction and satisfaction with significant quality domains. In the regression model based on performance-only scores, collection and access, service delivery, and Web services were significant predictors, while in the gap models, only furniture and facilities and building environment were significant. Overall correctness was better in the regression model based on gap scores at 76%. However, both regression models were not significant, as reported by Hosmer and Lemeshow test statistics (gap: H&L Test:  $X^2= 8.013$ ,  $p=0.331$ ; performance-only: Hosmer and Lemeshow Test:  $X^2= 3.868$ ,  $p=0.795$ ).

### **Selection of the best provisional model in the MLRA**

According to the preceding analyses, two provisional models were analysed by MLRA. A summary of the MLRA statistics of all provisional models is given below in terms of the F-statistics, significance level (p) and adjusted R<sup>2</sup>.

Provisional Model I	F= 94.669, p<0.001;	Adjusted R <sup>2</sup> = 0.295
Provisional Model II	F= 219.169, p<0.001;	Adjusted R <sup>2</sup> = 0.564

As reported by the adjusted R<sup>2</sup> in the MLRA technique. The figures clearly demonstrates the highest scores of adjusted R<sup>2</sup>, indicating that the best model in relation to the predictability of customer satisfaction is Provisional Model II, based on the performance-only paradigm.

### **Selection of the best model in the BLRA**

Consistent with the model analysis conducted in the previous sections, all provisional models were also analysed by BLRA. The summary of regression model statistics of the two provisional models is given below in terms of the Hosmer and Lemeshow test, significance level (p), Cox and Snell R<sup>2</sup> and Correctness.

Model I      Hosmer and Lemeshow test: X<sup>2</sup> = 8.013, p=0.331; Cox and Snell R<sup>2</sup> =.197;  
Correctness: 75.8%

Model II      Hosmer and Lemeshow test: X<sup>2</sup> = 3.868, p=0.316, Cox and Snell R<sup>2</sup> =.164,  
Correctness: 73%

All models based on binomial logistic regression were unable to demonstrate significant strengths of fits.

### **Socio-demographic attributes in overall customer satisfaction**

A series of one-way ANOVA tests were run to determine whether the perceptions of overall customer satisfaction differed with respect to the respondents' ages, genders, member categories and universities. Age has demonstrated an influence on satisfaction (F=2.735; p<0.05).. The members belonging to the age group 36-41 are more satisfied, compared with other age groups. It is apparent that member category affects overall customer satisfaction (F=4.421, p<0.05). It also suggests that the academic staff are more satisfied with overall service quality compared to the other groups. The university also has the ability to elicit overall customer satisfaction, as reported by F-statistics (F=35.915, p<0.001). Furthermore,

at the University of Colombo, people are more satisfied with the overall service of the library than in the other universities surveyed. Females were found to be more satisfied with the service compared to males.

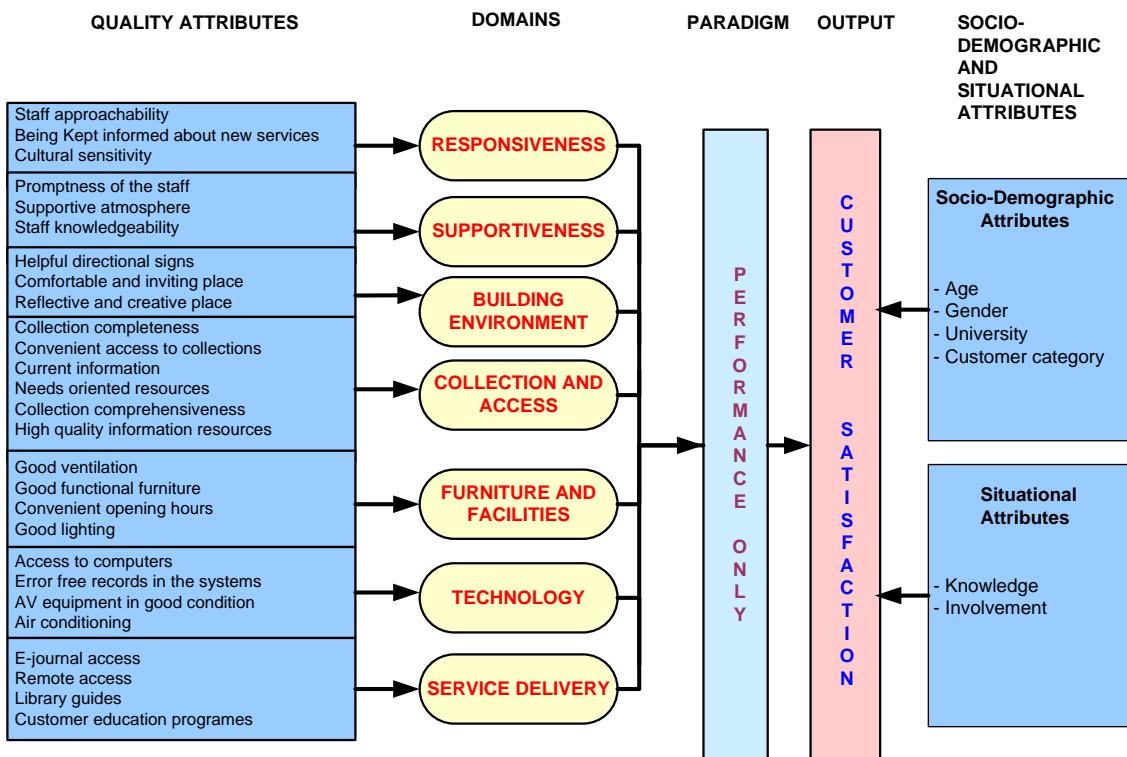
### **Situational attributes**

Since the situational attributes are ratios, the MLRA technique was used to determine the relationship with overall customer satisfaction as the dependent attribute. Of the four attributes entered into the equation, stepwise methods produced only two attributes as significant: involvement and knowledge. Vagueness was excluded from the final regression model, as it was not significant. The overall F-test for the final regression model was highly significant ( $F=7.022$ ,  $p<0.001$ ), exhibiting a significant relationship between the independent and dependent attributes. The proportion of shared variance as reported by adjusted  $R^2$  value equalled 0.015, which indicates that only 1.5% of the variance in overall customer satisfaction was accounted for by these three predictor attributes included in the model. The values for tolerance and VIF were in the accepted region.

### **Final Model**

Throughout the analysis, all the quality domains, with the exception of Web services, were found to be significantly associated with overall customer satisfaction. In individual quality domains, except the two domains of responsiveness and furniture and facilities, all attributes were significantly allied with respective quality domains. Even in the domains of responsiveness and furniture and facilities, a minimum of three attributes correlated with each particular domain. On the whole, Provisional Model II was substantially supported by the findings of the study, but some modifications were necessary, as indicated in the results of the analysis, to contextualise the model for Sri Lankan universities. This study therefore recommends on the basis of its findings that the selected Provisional Model II be improved by incorporating the significance of the findings, and that the attributes not significant to customer satisfaction be reconsidered. The model was consequently reduced to incorporate only the service quality domains of responsiveness, supportiveness, building environment, collection and access, technology, service delivery, and furniture and facilities. Age, gender, member category and university—as socio-demographic attributes—and involvement and knowledge—as situational attributes—were also incorporated into the model. Based upon these results, the revised version of Provisional Model II, that is, the final model of the study, is shown in Figure 3.

**Figure 3: The final model to predict customer satisfaction**



## DISCUSSION

Although a considerable number of formal research studies on customer satisfaction related to service quality in libraries have been carried out in the West, only a few such research studies have been conducted in the East. As reported and proven by other research studies in different service sectors in various cultures, the best method for predicting customer satisfaction is the performance-only paradigm (Cronin & Taylor, 1992; McAlexander, Kaldenberg & Koenig, 1994). The current study also provides evidence of its robustness and usability for generalisations on the performance-only paradigm in a different culture, such as university libraries in the Eastern hemisphere. Even if LibQUAL for library assessment is widely applied to any kind of library in any culture, the underpinning theory of the model based on the disconfirmation paradigm is built only to identify the discrepancies between customers' perceptions and expectations of services. Thus, it is apparent that the current LibQUAL is not yet an adequately developed tool to measure and represent a dependable library service assessment in different contexts of libraries in diverse regions in the world. Thus, it may be contended that the performance-only models—analysed by means of both multiple linear regression analysis and binomial logistic regression analysis—were always much stronger than the models based on gap scores. As a whole, the models derived from the performance-only paradigm predicted satisfaction of quality domains more

correctly, which further indicates that the individual service quality attributes are strong predictors of their respective service quality domains in libraries.

The most important theoretical contribution of this study is that the performance-only theory has been proven valid for determining customer satisfaction with service quality perspectives in the university library sector in Sri Lanka. It produces a better insight into the formation of customer satisfaction in relation to the university library sector by examining its attributes and domains. Thus, the overall contribution of this study to the service marketing philosophy is that it establishes the fact that performance scores of quality attributes follow some predictable pattern of customer satisfaction in university libraries.

This study further confirms the compelling argument raised by Bolton and Oliver in 1989, cited in Bolton and Drew (1991), that the customers' assessment of continuously provided public services may depend on performance-only evaluations. In an overwhelming finding, this study confirms the fact that the performance theory was advanced to determine customers' assessments of satisfaction in relation to service quality, by taking into consideration the fact that the library service is also a continuously provided public service in universities. This revelation has been now confirmed by the empirical findings of this study, signifying the fact that the customers' assessment of continuously provided public services may depend on performance-only evaluations.

The identified final model in this study is different from the outcomes of previous empirical research on service quality and customer satisfaction in the library sector. Also supported by other research in the field, this model proved that wherever the five SERVQUAL dimensions were not found, additional dimensions of quality were necessary. On the whole, service quality domains in this model prove to be useful as components for examining the predictive power of customer satisfaction. These domains provide theoretical and empirical explanations regarding the application of the conceptual framework on "customer satisfaction in relation to service quality" of library services, specifically, university academic libraries. As Jabnou and Khalifa (2006), Akbaba (2006) and Caro and Garcia (2007) pointed out, the applicability of generic models—such as SERVQUAL and SURVPREF—for measuring service quality is open to question. Moreover, it can be argued that a simple adaptation of generic models, such as LibQUAL and SERVQUAL, attributes and domains is insufficient to measure service quality across a diversity of service industries. In consonance with previously identified models in the literature suggesting that all models are multi-dimensional, seven domains were found in this study, too. It is apparent that the number of domains varied according to the service sector, like libraries and the country in question. For

example, the domain structure of the lodging industry in Australia (Wilkins, Merriless & Herington, 2007) was different from North America (Getty & Getty 2003).

In recent times, the relationship between quality and satisfaction has been questioned in some contemporary studies (Shahin 2004; Riviere *et al.*, 2006), while the majority of the research has taken the debate forward up to a point where the relationship is linear. However, the results of the multiple linear regression analysis used in this study showed that service quality attributes are significant factors in determining customer satisfaction, and the data of the study supported this predominantly accepted notion of linearity. The quality attributes and domains were regressed to determine whether a linear relationship exists with customer satisfaction in the sample. Residual plots against the predicted values of the dependent attribute of customer satisfaction did not exhibit any nonlinear pattern in the residuals, with regard to confirming the assumption of linearity in MLRA. However, BLRA was unable to offer better predictability and model fitness, compared to MLRA. Thus, the non-linearity assumption of the relationship lacked restraint, and it was concluded that the relationship between customer satisfaction and service quality in the university library environment is linear. Ting (2004: 407) says “much research on satisfaction is still using the linear function to measure the determinants of satisfaction.” This statement is proven by the study at hand, indicating that the relationship between the constructs is linear, though some studies have argued that the relationship is non-linear (Ting, 2004).

The greater the number of independents, the more the researchers are expected to report the adjusted  $R^2$  coefficient as a measure of evaluating the predictability of the models, based on the linearity assumption. The adjusted  $R^2$  is important when comparing models with different numbers of independents. Gujarati (2006: 229) recommends that even when comparing two regression models, it is important to determine the  $R^2$  value, as it explicitly takes into account the number of attributes included in the model. Therefore, the adjusted  $R^2$  was helpful to learn more about the predictability of models because it provided an indication of the extent of the variance in the performance outcome. The model has accounted for the population from which the sample was drawn. Furthermore, a visual inspection of the normal probability plot revealed that the residual plots were almost close to the normal straight diagonal line, suggesting that the residuals were of approximate normal distribution in confirming the greater validity of the final model.

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