Development and validation of an instrument to measure perceived service quality of an academic library in Costa Rica

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Abstract

Service management involves the responsibility of ensuring the effectiveness of business operations in terms of meeting customer requirements. A good service is judged not only by meeting customer requirements but also by the way the customers perceive and interpret the received service. To know how effective the service is, the quality of the service can be measured. For this aim it is necessary to target actual service elements to improve and to weigh the evaluation of service elements relative to the importance that customers place on them. The literature shows that service quality outcome and measurement are dependent on the type of service setting, situation, needs and other factors. General instruments to measure perceived service were developed in the context of main dimensions proposed by general service quality models. However, it is important to develop new instruments which are directly targeted to the context reality. Based upon conceptual models the goal of this study is to target actual service elements that customers from an academic library in Costa Rica deem important. Using the identified elements the dimensions of service quality are developed and validated to measure user perceived service. It was discussed how appropriable knowledge on quality service can spurred the innovative capacity to improve library services.

Keywords: Quality Service, Scale Development, Operation Management.

Introduction

In recent years universities have adopted new models of teaching and learning, giving greater prominence to the transfer of skills and competences as well as the use, development and dissemination of information. University facilities, including libraries have been experiencing pressure confronting the new academic tendencies, the research needs and the request to assess the degree to which their services demonstrate criteria of quality. This assumption of new educational models and research needs, together with the constant changes in information and communication technologies, presents new scenarios, challenges and opportunities for the libraries.

The effectiveness of a library operation can be measured by service quality. Traditional quality measuring approaches of the academic library is based on quantitative indicators. In fact, the concept of quality is allusive in terms of collections (size, titles held and breadth of subject coverage) and the effectiveness (extent to which goals and objectives are set and meet) of library services, (Nitechi and Hernon, 2000). Today for libraries these indicators are not sufficient because they do not necessarily measure the quality of the provided service. Pinto et al. (2007) note that the quality of libraries has been based more on the vision of the library. These authors, based on other studies indicate that this situation has changed with the growing importance of technological factors, presence of virtual libraries and the impact of economic factors focused on the high cost of maintenance of the collections. According to this point specialists in university libraries (Cook et al., 2001) agree that the best counselors of the service quality in libraries are their users. The library personnel and managers can improve the performance of their service knowing better their users. Nitecki (1996) points out that those library users are not only recipients of the service, they are partners in the development and implementation of the service. It also draws on the support of measuring more abstract indicators (such as perceptions and attitudes) as indicators of the quality of service.

In the literature, the concept of quality service remains as an ambiguous concept (Seth et al., 2005; Roszkowski et al., 2005; Randomir et. al., 2012). These last authors present a study of the evolution of the service quality concept. Many of these definitions are founded by a user-based approach and hold the idea that quality is subjective and can only be determined by the users. The research has tended to define service quality in terms of meeting or exceeding customer expectations. One of the most influential definitions is given by Parasuraman et al. (1988). They define service quality as the degree of discrepancy between customers' normative expectations for the service and their perceptions of the service performance. In addition, the same authors explain (Zeithaml et a., 1990) that perceived service quality is a function of different dimensions. These dimensions are intended like the attributes characterizing the service. Then service quality is influenced by customer perceptions of service attributes or service quality is determined as an index based on customers' judgment of several service attributes (Randomir et al., 2012). It is concluded that the quality of a library service can be understood from the point of view of the perception of the user or customer related to the service provided.

Different approaches to measure service quality are emerging. Though, factors like the complexity of the subject to measure and the type of service setting make it difficult to define an ideal quality service model and instruments to measure the customer satisfaction. The aim of this work is to provide a university library in Costa Rica with a tool for analyzing and measuring customer satisfaction service. The tool could be used to measure the own progress towards meeting those customer expectations, to review service policies and to support operational decisions.

The paper is organized as follows. The following section reviews the service quality assessment embracing the most important measurement tools. Another section describes the Jose Figueres Ferrer Library of the Technological Institute of Costa Rica. Then the measurement process and steps involved in the scale development are explained. The next section presents the results. The final section presents the conclusion and discusses how the quality service can improve the library services.

Quality Service Assessment

During the past few decades service quality has become an area of attention for researches and practitioners. There has been a continuing research on the definition, modeling, measurement, data collection procedure and data analysis. Seth et al., (2005) examines 19 different service quality models reported in literature. In their study, the authors conclude that the outcome service quality and measurement depends on factors such as type of service settings, situation, time, needs, among others. It does seem to have neither a well-accepted conceptual definition nor a model of service quality. However, many of the models and definitions support the view of evaluating the service quality by comparing the service quality expectation of the customers with the perceptions of the experienced service quality by the customers.

An important contribution in the subject of quality service has been given by Parasuraman et al. 1988. Their research consists of a series of qualitative (focus group and individual interviews) and quantitative (customer surveys) studies. Following this idea a major outcome of their work is a conceptual framework, the Gap model of the Service Quality and a measurement instrument for assessing service quality named SERVQUAL. Probably this instrument is the best known and most commonly used scale (Ladhari, 2009). AL operates service quality by subtracting customers expectation score from their perception scores of a 22 items scale for measuring service quality along the next five dimensions: reliability, responsiveness, assurance, empathy and tangibles. This instrument has been used for measuring service quality in a variety of contexts like health care, banking, higher education accounting firms, telecommunications, retail changes, information systems and library services (Cook and Thompson, 2000). SERVQUAL has begun to be employed by libraries in the 1990s and it is criticized for limitations on the validity of its methods (Buttle, 1994; Liangzhi, 2008 and Ladhari, 2009). In library applications the reliability and the validity of the tool is discussed (Cook and Thompson, 2000, Nitechi, 1996, Nitechi and Hernon, 2000 and Cook and Heath, 2002). However, SERVQUAL remains as a useful instrument for service quality research.

Shih et al. (2011) analyze the measurement instruments used by the libraries of the first ten universities classified by the Times Higher Education-QS Word University Ranking in 2010. The study shows that most of the libraries of the surveyed universities use or develop their own assessment tools. Another common option is to use a specific tool named LibQUAL as described below. Hufford (2013) reviews the literature on assessment of academic and research libraries. The author provides an examination of the coverage since 2005 to 2011 to disclose new developments, ideas, and directions in the assessment of these libraries. He concludes that quality assessment library is reflected in considerable books and conference papers, finding also that LibQUAL survey is much applied. LibQUAL is an assessment instrument based on Gap theory by which libraries can determine the users 'opinions of their service quality. The main instrument of this tool is a web-based survey developed in 2003 by the Association of Research Libraries (ARL) in collaboration with Texas A&M University Libraries. LibQUAL positive implementation experiences can be found published in the literature together with its continuous development and improvement (Cook et al., 2001, 2002; Thompson et al., 2000). The ARL has an extensive bibliography of significant papers, presentations, and articles that review the use and the analyses of this instrument (http://www.arl.org/focus-areas/statistics-assessment/libqual).

It is agreed with some authors that state that the effectiveness of a model used to measure the quality service depends on things as the operations of the library, the groups it serves, the values provided to the customers, the models for funding libraries,

the obligations of academic libraries and the users of the library in need of professional assistance. Given this premise, a new assessment tool based on the reality of the TEC library was developed.

The Library of the Technological Institute of Costa Rica (TEC)
The TEC is a state public university of higher technical education and it is dedicated to teaching, research and extension in the area of technology and related sciences. The TEC offers 23 engineering programs in its four campuses with a population of about 10.000 students, while the principal campus serves 6.000 students approximately. The main library is located in the principal campus and from here it provides the main service as well as support to the other three libraries of the university. The TEC libraries serve principally the members of the TEC community, like departments, personnel and students of bachelor or Master programs. The aim of the TEC libraries is to create and sustain an evolving information environment with advanced learning, research, and innovation activities. The services of the library are designed to access information and knowledge through printed material, record keeping collection and electronic resources like digital data bases. Also, it offers a counseling services and information through lectures, workshops, virtual guided tours, chats, e-mails and online tutorials. Complementary to the main service, the library offers spaces for individual study, rooms for group study, wireless internet and a media room. By means of an agreement with more than 50 national institutions the TEC library provides an interlibrary loan service.

The TEC libraries do not formally asses its services through regular tools as well as they do not evaluate user needs. The purpose of this study is to develop a questionnaire that can help the library to ensure that physical and virtual services meet the needs of the community of TEC. The survey was designed and applied to the academic and research staff only.

The measurement process
As a questionnaire or a scale that assesses the quality service by the perceptions of customers was developed, the measurement problems to ensure that the scores derived from these instruments must consider as well as its accurate reflection of information about these underlying constructs. A number of researches have proposed several procedural models to help other practitioners to develop better scales for their studies in customer satisfaction (Churchil, 1979; Seth et al., 2005) and also how to analyze the information data (Catellani et al.; 2005; Catellani et al. 2006). In general, there are two important measurement issues to consider when designing questionnaires: reliability and validity. The common steps include conceptualization, design and normalization. The first step focuses on content validity; the purpose is to generate a candidate list of elements from the domain of all possible attributes representing the construct. The second step focuses on construct validity and reliability analysis. It redefines the sample of elements from the previous step. It focuses on examining the relationships among many variables, e.g., the validity of convergence is investigated to know whether the scale is correlated with the variables that should be correlated. The last step concerns the effort to normalize the scale that has been developed. However, this step is omitted in this study.

In order to conceptualize the construct, employee and customer interviews were carried out. Employee research completes customer research when service quality is the issue being investigated (Parasuraman et al., 1990). The aim of this step is to generate a list of elements that could be the attributes representing the construct. Twenty

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employers were interviewed with open questions like "What are the problems you face out while trying to deliver the service to your customer?", thus obtaining the first list of elements or possible attributes from a universal pool. Twenty five customers (professors and/or research staff) were interviewed with open questions like "Which positive and/or negative experiences have you had with the library service?" By recording and analyzing the answers a second list of elements was obtained. Next the academic literature and relevant service quality models applied or not to a library service quality were investigated. In this way, some similar elements and other elements that could represent the concluding list of all possible attributes representing the construct were identified. The three list of elements were initially classified by similarity of elements to construct only one list. This classification was made by three independent working groups. Then the results of each group were compared and the identified discrepancies were discussed between groups to reach consensus. After this evaluation process, 29 attributes remained in the last list and it includes elements that hypothetically characterize the service quality.

As a second step the scale design that focus on conduct validity and reliability analysis was discussed. It consists on investigating whether the chosen measures are true constructs describing the event. The selected 29 attributes in a questionnaire format in preparation for a data collection were arranged. Two types of measurement were considered: perceived quality and importance given to each element in the questionnaire. These two types of measures by each element in the questionnaire were calculated using a five-point scale ranging from (1) Much less than most, (2) Less than most, (3) Above average, (4) More than most, (5) Much more than most. Additionally, a sixth option for a customer that do not use or know the evaluated element (NS) was included. One more question was asked about the department of provenience. A drafted-questionnaire to 10 costumers was administered and they were asked to screen it. After some arrangements implementing their suggestions the final version was defined. According to the Gap theory, customer's satisfaction constitutes the gap between customer expectations and the service that is actually received. However, Roszkowski et al. (2005) demonstrated that the score that most validated their study was the perceived rating rather than the gap scores. Here the analysis of perception score is presented and it is called customer satisfaction measurement.

To determine the sample size the Eq.(1), where n is the sample size, N is the population size, e is the sampling error, z is corresponding to the significance level (95%) and pq is the variance of the dichotomous items, which is maximum when $p = q = 0.5$ was used.

$$n = N \Big/ \left(1 + \frac{e^{2(N-1)}}{z^2 pq}\right) \tag{1}$$

For a population size 530 and considering an error of 0.05 the sample size is 223. An invitation letter with a hyperlink to the web page with the questionnaire was send to the customers. The letter explained the purpose of the study and encouraged the subscribers to participate in the survey to help improve the library service. A total of 207 responses were received.

Whether the chosen measures are true constructs describing the event were investigated. In the insight of this step the exploratory factor analysis was used. The first step to carry out this analysis is for ensuring that there is sufficient correlation between variables. Following Field (2009) the correlation matrix, the anti-image matrix, the Bartlett´s test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy were explored. The second step is to identify major service quality

dimensions and conduct a principal component analysis with a Varimax rotation and using an eingenvalue criterion ≥ 1. The process went on until a meaningful factor structure was reached.

Results

The results of the 207 received answers were computed. Almost all the departments of the university participated in the survey, as shown in Fig. 1.
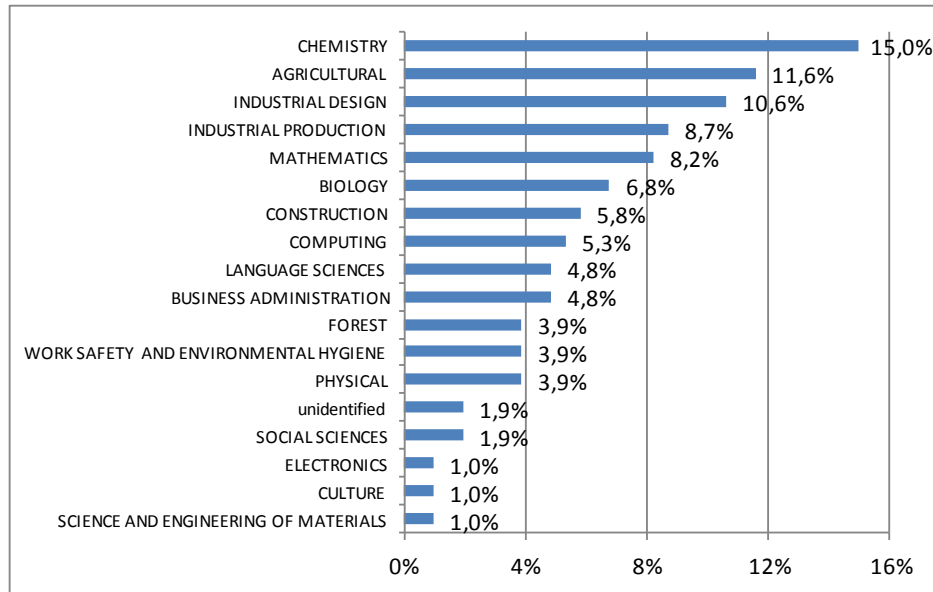

Figure 1 – University Department participated in the survey.

The survey did not allow leaving unanswered items. It was found that 23% of customers checked the NS or "do not use or know the evaluated element" option. This is an interesting result that deserves a deeper analysis. Now the problem is that reliability could be affected by the sample size. All calculations were performed with the help of SPSS software. The option "excluded cases pairwises" was used to deal with NS score. The procedure cannot include a particular variable when it has a NS mark, but it can still use when analyzing other variables with non-NS mark. Descriptive statistics and number of samples are shown in Table 1, missing N are the NS scores.

If some questions, from the survey, measure the same underlying dimension(s) then it would be expected that the elements considered are correlated with each other. In that case factor analysis will be useful. Analyzing the correlation between variables the determinant of the related matrix obtained is $3.19E-009$ which indicates that there will be problems with multicollinearity or singularity. KMO test is 0.828 indicating that there are some relationships between variables. Bartlett´s test of spheracity refuses the hypothesis that the correlation matrix is an identity matrix with $p-value \approx 0.0$. To carry out factor analysis a principal component analysis was used. To know how many factors should be retained by the analysis factors with eigenvalues over 1 were selected. The eigenvalues associated with each factor represent the variance explained by that particular linear component. Varimax rotation was used to improve the interpretability of factors. The initial factor analysis extracted five factors but then elements that did not load strongly on any factor (cut-off point of 0.5) were eliminated.

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Table 1: Descriptive statistics.

	Mean	Std. Deviation	Analysis N	Missing N
wall outlet	3.51	1.019	90	117
reading, studying and focusing conditions	3.68	.964	142	65
physical spaces	3.65	.944	143	64
coordination for material adquisition	3.53	1.156	178	29
facilities for disabled users	3.86	.971	79	128
course supporting training for database search	3.48	1.045	113	94
intranet access	4.08	.880	179	28
remoute acces	3.59	1.060	158	49
availability of updated databases	3.74	1.000	182	25
spread database coverage	3.52	1.056	186	21
adequate quantity of supporting books for courses	3.38	.976	188	19
adeauate audiovisual material in the field of your interest	3.17	.909	147	60
friendly web interface of material search	3.65	1.075	176	31
effectiveness of response when using keywords	3.70	.994	174	33
attitude of staff to address users' concerns	4.34	.908	195	12
professionalism of the library staff	4.342	.7655	190	17
adaption to new trends and users' needs	4.04	.959	179	28
adapated service shedules	3.92	.977	173	34
time policies of the borrowed material	3.86	1.003	180	27
management and updating of users data	3.67	1.030	149	58

A total of 9 items were deleted after 17 iterations. The remained 20 items were analyzed. KMO (0.858) and Bartlett test ($p - value \approx 0,0$) demonstrate adequacy. The determinant of the correlation matrix is now $1.55E - 0.005$ eliminating the problems with multicollinearity. Table 2 displays the eigenvalues in terms of the percentage of variance explained, the first 5 factors explain the 67,694% of the total variance. Table 3 shows the distribution of attributes by dimensions.

Considering the five factors of Table 3, the first one is composed by six attributes which appear to be the most important dimension because it explains the largest portion of 15.55% of the total variance. This dimension is called responsiveness which is composed by attributes of adequacy of the material and supported for academic courses. The second dimension, accessibility, represents 14.344% of the total variance and consists of four items measuring the effectiveness of on-line access to the library (intranet and remote), the friendly web interface and the effective response of keywords search. The third dimension is related to tangibles, it represents 13.472% of the variance and it refers to the need of wall electrical outlets. The fourth factor describes 12.689% of the variance and it was called supporting activities. It consists of four items that address interactions of customers and policies of lending, updating data and opening and/or closing time and amenities for the access of disabled people. The last factor, assurance, explains 11,639% of the variability and consists of three items related

to a) knowledge, b) courtesy of employees and c) the disposition of the library and the staff to adapt to new trends and user needs.

Table 2: Total Variance Explained.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.807	39.035	39.035	7.807	39.035	39.035	3.110	15.550	15.550
2	1.759	8.795	47.830	1.759	8.795	47.830	2.869	14.344	29.894
3	1.585	7.924	55.754	1.585	7.924	55.754	2.694	13.472	43.366
4	1.242	6.208	61.962	1.242	6.208	61.962	2.538	12.689	56.055
5	1.146	5.732	67.694	1.146	5.732	67.694	2.328	11.639	67.694
6	.828	4.141	71.835						
7	.725	3.624	75.459						
8	.677	3.385	78.844						
9	.619	3.097	81.941						
10	.545	2.727	84.668						
11	.473	2.364	87.033						
12	.453	2.264	89.296						
13	.394	1.970	91.267						
14	.367	1.835	93.102						
15	.334	1.668	94.770						
16	.281	1.406	96.176						
17	.232	1.162	97.338						
18	.201	1.007	98.345						
19	.189	.944	99.290						
20	.142	.710	100.000						

Extraction Method: Principal Component Analysis.

Table 3: Rotated component matrix.

	Component				
	1	2	3	4	5
Audiovisual material in your field of interest	.721				
Updated databases	.656				
Books number supporting courses	.648				
Coordination for material purchase	.645				
Course supporting for database search	.562				
Spread database cover	.540				
Remoute acces		.748			
Friendly web interface		.730			
Intranet access		.666			
Effectiveness keywords responses		.635			
Enviromental conditions			.836		
Physical spaces			.750		
Wall outlet			.677		
Policies of the loan material				.748	
Face time service				.732	
Management and updating of user data				.665	
Facilities for disabled people				.561	
Professionalism of staff					.876
Attitude of staff to address their concerns					.827
Adapting to new trends and user needs					.577

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 10 iterations.

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Conclusions

In the study a scale development procedure was employed to establish a tool which measures customer' perceived service quality in the library of the TEC. Each of the five dimensions identified in the procedure have a significant impact on service quality. The twenty attributes that are part of these dimensions can serve for a useful diagnostic purpose. This study is a first step in formally exploring the way to assess service quality in the TEC's library. In terms of practical implications, the tool provides an important method for assessing the quality. The scores help the managing service quality by targeting service elements to be improved. The use of this instrument provides a fast and early feedback to the service. If a problem is found in the library with one dimension, a more detailed analysis might be carried out and the necessary corrective actions would be undertaken. The attributes may also be used in a proactive manner to improve operations and exceed customer expectations. Following Seth et al. (2004) customer expectations towards a particular service are also changing with respect to factors like time, increase in the number of counters with a particular service, and environment, among others. Then, the innovative assess service quality demands for a continuous effort to improve and validate the concepts of a service quality.

The study has some limitations because the developed scale was not normalized. The data was only collected from customers of the main campus then the generalization of the scale to other campuses still needs to be reviewed.

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