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# Impact of service quality on user satisfaction in public university libraries of Bangladesh using structural equation modeling

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## Abstract

**Purpose** – The study aims to appraise the impact of service quality dimensions on user satisfaction in Bangladeshi public university libraries using structural equation modeling (SEM).

**Design/methodology/approach** – This study developed an SEM method based on SERVQUAL, LibQUAL+ and SERVPERF instruments, including 30 items under five service quality dimensions and eight satisfaction items with the 7-point Likert scale to appraise the impact of library service quality dimensions on user satisfaction. For this purpose, a survey was carried out among 437 students, 52 MPhil/PhD researchers and 32 teachers of the nine selected public university libraries of Bangladesh through a structured questionnaire. The SEM approach included path analysis, confirmatory and exploratory factor analysis, as well as construct reliability and validity where user satisfaction was used as the dependent variable, and five service quality dimensions were applied as independent variables.

**Findings** – This model was identified as significant and clarified 58% of the total variation in user satisfaction. The study findings indicated that resources of the libraries, staff competence, demeanor approach and tangible facilities of the public university libraries have a significant impact on user satisfaction.

**Originality/value** – An initiative has been taken for the first time to ascertain the impact of library service quality on user satisfaction applying the SEM approach in Bangladesh. Moreover, it creates an avenue to prompt future studies on the structural relationship between user satisfaction and service quality dimensions in academic libraries globally.

**Keywords** Bangladesh, University library, Structural equation modeling, Impact, Service quality, User satisfaction

**Paper type** Research paper

## Introduction

The government is responsible for the framing of the education policy of Bangladesh, and "University Grants Commission" (UGC) is the statutory apex body in higher education for supervising, maintaining, promoting and coordinating the quality of all Bangladeshi universities. Currently, there are 2 international, 50 public and 108 private universities in Bangladesh (UGC, 2021). The public universities of Bangladesh are "autonomous and funded by the government" (Alam, 2018, p. 3). Academic libraries are service-oriented organizations that are being hearts of the learning community for providing a place for the teachers, students, and researchers to meet the teaching, learning and research needs. Presently, university libraries have become more user-focused for increasing users' awareness, competitive pressures, rising costs and information availability (Andaleeb and Simmonds, 1998). Most Bangladeshi university libraries are trying to improve their teaching, research and learning tools, and change the process of providing and sharing information to the users through information and communication technology (ICT)-based services (Alam and

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Mezbah-ul-Islam, 2019). Increasing user awareness, applying ICT in university libraries, improving the method of providing and sharing information to the user community, and the availability of e-resources both offline and online have made library professionals confused about whether the users get appropriate services from the libraries when needed (Alam, 2021). To design appropriate strategic plans for improving, maintaining and ensuring user expected library service, it is necessary to periodically evaluate the existing service quality (Andaleeb and Simmonds, 1998) concerning the available collections, services, facilities and staff performance (Mezbah-Ul-Islam, 2003).

SERVQUAL, LibQUAL and SERVPERF instruments are being used to evaluate library service quality globally and its impact on customer satisfaction (Asemi *et al.*, 2010; Choshaly and Mirabolghasemi, 2019). The multiple regression analysis is being used to measure the impact of service quality on customer satisfaction in various service sectors, including all types of libraries. SEM is the comprehensive and multivariate analytical technique developed to cover the limitations of previous analytical models (Wala *et al.*, 2020). SEM approach is an extension of regression methods (Ko and Stewart, 2002) that becomes an efficient tool to analyze structural relationships between latent variables (Kazár, 2014). Researchers currently prefer the SEM method to appraise the impact of library service quality on satisfaction because it incorporates path analysis, confirmatory and exploratory factor analysis, as well as construct reliability and validity in a single analytical process.

However, from the available literature, it is found that very few studies were done on assessing library service quality effects on satisfaction through regressions analysis (Alam, 2021; Amanullah *et al.*, 2021), but no research was done to appraise the impact of library service quality on satisfaction using SEM in Bangladesh. Therefore, based on the research gap and social impact, this study has taken the initiative for the first time to appraise the impact of service quality dimensions on user satisfaction in the university libraries of Bangladesh from the viewpoints of teachers, students and researchers developing an SEM, based on SERVQUAL, LibQUAL+ and SERVPERF instruments.

## Literature review

The history of service quality can be traced to 1982 when Christian Gronroos wrote a book titled "Strategic management and marketing in the service sector" (Gronroos, 1982). Partap (2019, p. 2) defined quality as a "degree of excellence towards resources and services provided to users" where the "users can get maximum satisfaction and feel delighted". Hoffman and Bateson (2011, p. 319) defined service quality as "an attitude formed by a long-term regarding the overall evaluation of a firm's performance". Martensen and Gronholdt (2003) conducted a review of the available literature and surveyed focus groups representing the fundamental determinants of library service quality: printed and electronic resources, library environment, technical facilities and staff performance. University library staff is responsible for understanding the users' specific needs and expectations to make available competent library services for their user community that strengthen their position in a competitive environment (Andaleeb and Simmonds, 1998). Sahu (2007) stated that when a library provides the right information to the right user at the right time in an appropriate system, it may be considered that the library is providing quality service to the users. Thus, library service quality is the attitude formed by a long-term concerning the overall assessment of the libraries' service performance.

Hoffman and Bateson (2011) stated from a historical perspective that the concept of user satisfaction began in the 1970s when consumerism was on the rise. The user is considered as the fundamental issue for service providers to develop relationships with users by understanding their requirements and building more value by creating an inventive service system that will lead to user satisfaction and retention. The service system consists of

delivery, interpersonal dealings, and user experience or service performance. Cronin and Taylor (1992) defined user satisfaction as the conceptualized user experience on a specific service encounter. Jones and Suh (2000) considered user satisfaction as the cumulative overall assessment of service experience. Sapri *et al.* (2009) defined user satisfaction as a short-term attitude that stems from the user evaluation based on their previous experience with the perceived service. Afthanorhan *et al.* (2019) explained library user satisfaction as the quality of library service performances that reach user expectations. Satisfied users constantly promote the university to their associates and friends (Ali *et al.*, 2016), creating any university as a brand (Farooq *et al.*, 2019). Libraries that constantly satisfy their users enjoy more excellent retention and higher productivity because of increasing users' loyalty (Wicks and Roethlein, 2019). Therefore, user satisfaction is the short-term perception of library users that contributes to their satisfaction with library services.

Sumaedi *et al.* (2011) mentioned that various researchers in diversified perspectives discussed the relationship between library service quality dimensions and user satisfaction. Parasuraman *et al.* (1985) stated that higher perceived service quality increases user satisfaction. Wang and Shieh (2006) showed that library service quality influenced user satisfaction and explained that library service quality and user satisfaction play a vital role in the achievement and sustainability of any organization in the competitive world. Thus, the impact is the significant effect of library service quality on user satisfaction.

Service quality assessment through user opinions is essential for academic libraries' growth and development; that helps to attract new users and retain existing users in the present competitive service atmosphere (Alam, 2021; Moreira *et al.*, 2009). The SERVQUAL was developed to assess service quality for the business sector in 1985 and later on modified in 1988, 1991 and 1994 by Parasuraman *et al.* (Alam, 2021). Afterward, it has been mostly used to evaluate library service quality with necessary change (Ahmed and Shoeb, 2009). Parasuraman *et al.* (1985, p. 48) initially included ten conceptualized dimensions in SERVQUAL, i.e. "access, communication, competence, courtesy, creditability, reliability, responsiveness, security, tangibles and understanding/knowing the customer". Then Parasuraman *et al.* (1988, p. 23) combined these ten variables into five dimensions, including all the facets of the ten initial variables, which are "tangibles, reliability, responsiveness, assurance and empathy," including 22 items. Cronin and Taylor (1992, p. 58) presented a critique of the SERVQUAL and introduced the SERVPERF model, including 22 items on five dimensions, i.e. "tangibles, reliability, responsiveness, assurance and empathy" based on SERVQUAL of Parasuraman *et al.* (1988). Cook *et al.* (2001) designed LibQUAL based on SERVQUAL, including 22 items under three dimensions: "affect of service, library as place and access to information" to assess user opinion on library service quality.

Andaleeb and Simmonds (1998, p. 163) explained user satisfaction of the university libraries in the USA by conducting a regression analysis where "demeanor, competence, resources responsiveness and tangibles" were used as independent variables and user satisfaction was used as the dependent variable and found that the users have given significant importance on staffs' demeanor approach and library resources. In Bangladesh, several studies (Alam, 2021; Alam and Mezbah-ul-Islam, 2021; Hossain, 2016; Shoeb, 2011) applied the five dimensions of Andaleeb and Simmonds (1998) for conducting service quality measurement in different university libraries. The majority of service quality researches in Bangladesh (Alam, 2021; Alam and Mezbah-ul-Islam, 2021; Hossain and Ahmed, 2013, 2014; Shoeb and Ahmed, 2009) invited respondents to rate each item on a "seven-point Likert scale ranging from 1 lowest to 7 highest".

SEM is used to build and test a causal relationship model that has gained popularity because it usually combines path analysis, confirmatory and exploratory factor analysis, as well as construct reliability and validity to measure loading value of latent variables, assess the structural relationship between latent variables and compute the path model of latent

variables simultaneously (Long *et al.*, 2019; Kiran and Diljit, 2012; Wala *et al.*, 2020; Moses *et al.*, 2016). Path analysis is causal modeling directly related to the multiple regression analysis, which describes the "directed dependencies among a set of variables". Path models are usually made up of "independent and dependent variables" represented "graphically by boxes or rectangles". Independent variables are recognized as exogenous those variable boxes lie at the outside edges of the model and only have "single-headed arrows". The endogenous variables are purely dependent variables or those that are "both independent and dependent variables" represented graphically by at least one "single-headed arrow" (Faculty.cas.usf.edu, 2021). Confirmatory factor analysis (CFA) is a multivariate statistical method for appraising whether measured variables appropriately represent the number of constructs. Besides, it enables researchers to determine the number of variables that must be present in the data as well as which measured variable is connected to which latent variable (Faculty.cas.usf.edu., 2021).

Different statistical software packages: SmartPLS, LISREL, EQS, AMOS, ROMANO and LISCOMP are used to calculate the SEM approach (Wala *et al.*, 2020). Besides, globally different researchers used SEM method for assessing library service quality perceptions (Thompson *et al.*, 2003), developing and validating a library service quality measurement model (Kiran and Diljit, 2012), evaluating user satisfaction of university libraries (Che *et al.*, 2013), measuring library service quality perception and satisfaction (Hsu *et al.*, 2014), analyzing factors affecting library service quality (Bae and Cha, 2015), evaluating relationship of library service quality, satisfaction and loyalty (Wantara, 2015), assessing satisfaction of library service quality (Choshaly and Mirabolghasemi, 2019), evaluating effects of library services quality (Griadhi *et al.*, 2018), developing a technology development model for assessing library service quality (Wibisono *et al.*, 2018), evaluating effects of library service quality on satisfaction (Afthanorhan *et al.*, 2019); measuring user satisfaction with library services quality (Long *et al.*, 2019) and analyzing factors affecting university library service quality (Wala *et al.*, 2020). Farooq *et al.* (2019) conducted a path analysis with exploratory and confirmatory factor analysis under SEM to appraise the effect of service quality dimensions on user satisfaction in Malaysian university libraries and found that except empathy, three variables, i.e. tangibles, responsiveness and reliability, significantly influenced user satisfaction. Suki and Suki (2013) revealed that all the independent variables, i.e. "assurance, empathy, reliability, responsiveness and tangibles", influenced customer satisfaction significantly in a Malaysian university library. Wang and Shieh (2006) revealed that assurance, empathy, reliability and tangibles facilities of a university library in Taiwan have a significant effect on user satisfaction.

In Bangladesh, several studies have been done on evaluating library service quality effect on satisfaction (Alam, 2021), developing a service quality assessment model (Alam and Mezbah-ul-Islam, 2021), assessing library service quality (Alam, 2020), assessing library service performance (Karim, 2018), measuring service quality and satisfaction (Hossain, 2016); developing service expectations measurement scale (Hossain and Ahmed, 2014); budding service performance measurement system (Hossain and Ahmed, 2013); measuring service quality perception and satisfaction (Hossain and Islam, 2012); discovering tolerance zone, service superiority and dimensions (Shoeb, 2011); assessing gender perception of library service quality (Shoeb, 2010); measuring individual differences in library service quality (Shoeb and Ahmed, 2009) and assessing library service quality (Ahmed and Shoeb, 2009). However, no study was found based on available literature to appraise the impact of library service quality on user satisfaction using SEM in Bangladesh. Therefore, a conceptual framework of SEM is appropriate for appraising the impact of library service quality on satisfaction, where user satisfaction is a dependent variable and five service quality dimensions, i.e. "resources, competence, responsiveness, demeanor and tangibles", are independent variables. Thus, using such an SEM approach, it is expected to appraise the impact of library service quality dimensions on user satisfaction in the public university libraries of Bangladesh.

## Hypotheses

Here a question is raised which service quality dimensions have a significant impact on user satisfaction in the public university libraries of Bangladesh. Based on the research gaps, raised questions and objective, the study has formulated the following hypotheses:

*H1.* Resources in the university libraries positively influence user satisfaction.

*H2.* Competent service of the library staff positively influences user satisfaction.

*H3.* Responsiveness of the library staff positively influences user satisfaction.

*H4.* Demeanor approach of the library staff positively influences user satisfaction.

*H5.* Tangible facilities of the libraries positively influence user satisfaction.

## Methodology

### *Research design*

This study applied a quantitative method to appraise the impact of service quality dimensions on user satisfaction in the public university libraries of Bangladesh. Both secondary and primary data were collected for this study. At first, relevant secondary sources had been reviewed to understand the existing literature on library service quality, user satisfaction, the relationship among library service quality dimensions and user satisfaction, SEM and service quality assessment tools. For this purpose, an SEM was developed based on SERVQUAL, SERVPERV and LibQUAL instruments where user satisfaction was used as a dependent variable and resources, competence, demeanor, responsiveness and tangibles were applied as independent variables. This study carried out a survey through a structured questionnaire to collect primary data, where the respondents were asked to give their opinion on the service quality and satisfaction of their university libraries. The SEM method included path analysis, confirmatory and exploratory factor analysis, as well as construct reliability and validity. Besides, various statistical methods were applied to measure the model's internal consistency, reliability and validity.

### *Questionnaire design*

For this study, a structured questionnaire was developed, including demographic information, thirty items of service quality under five dimensions and eight items of user satisfaction.The service quality items were taken from SERVQUAL, SERVPERV and LibQUAL literature under five dimensions, i.e. resources, competence, demeanor, responsiveness and tangibles. Among the eight satisfaction items, the first five were made based on the five service quality dimensions respectively, and the last three were developed to know the user eagerness for future use of their libraries, user enthusiasm for sharing the services to others of their libraries and overall service quality of their libraries. Then all the service quality and user satisfaction items were adapted as per the arrangements of university libraries consulting with some Library and Information Science (LIS) researchers, including professionals and academicians. Finally, an agreement scale was administered from 1 lowest to 7 highest following a 7-point Likert scale.

The study had chosen five service quality dimensions, i.e. resources, competence, demeanor, responsiveness and tangibles, effectively covering the full services of university libraries. The study included the "resources" dimension from Andaleeb and Simmonds (1998) due to the availability of resources that can contribute to user satisfaction, which significantly influences user retention (Andaleeb and Simmonds, 1998). Besides, among the five lows of Librarianship by Ranganathan, library resources are closely related to the first, second and third laws, i.e. "books are for use, every reader his or her book and every book its

reader" (Ranganathan, 1988). The "competence" dimension was taken from the ten conceptual dimensions of Parasuraman *et al.* (1985) instead of the reliability dimension of Parasuraman *et al.* (1988). Because several items, i.e. accuracy in billing, keeping records correctly, etc. were suggested for reliability dimension by Parasuraman *et al.* (1988), which did not fit for the academic library settings because library users generally would be unable to assess these elements (Andaleeb and Simmonds, 1998). The previous two dimensions, "assurance and empathy" of Parasuraman *et al.* (1988), were combined into a separate one "demeanor" combining some assurance and empathy components and deducting the overlapping components between them. The "responsiveness" and "tangibles" dimensions were taken from Parasuraman *et al.* (1988) due to using these dimensions by different studies (Andaleeb and Simmonds, 1998; Wang and Shieh, 2006; Musyoka and Chirchir, 2013; Simmonds and Andaleeb, 2001; Suki and Suki, 2013; Kandie, 2018; Farooq *et al.*, 2019) to evaluate library service quality dimensions on user satisfaction. Besides, "user satisfaction" was taken as the dependent variable for the reason that different studies (Farooq *et al.*, 2019; Bae and Cha, 2015; Afthanorhan *et al.*, 2019; Long *et al.*, 2019; Wibisono *et al.*, 2018; Moses *et al.*, 2016; Kandie, 2018) used it as the dependent variable to evaluate the impact of library service quality dimensions using SEM approach.

The resources dimension in the study represents all available library resources and their easy access. The competence dimension signifies the ability to perform the promised service dependably and accurately. The demeanor dimension embodies the knowledge and courtesy of the staff and their ability to care and individual attention to the users. The responsiveness dimension represents the willingness to help users and provide prompt service. The tangibles dimension characterizes the appearance of staff, physical facilities, equipment and communication materials. User satisfaction specifies the perception of the teachers, students and researchers of the selected libraries that contributes to their satisfaction with library services.

*Population, sample and data collection*

Among the forty-nine public universities, nine were selected for the study whose libraries presently having integrated library systems, digital institutional repository, library website and access to e-books and online journals. Among the 700 delivered questionnaires as per the simple random sampling method, 582 (83.14%) questionnaires were returned, which was recognized as a very good response rate as per the criteria (70%) of Mugenda and Mugenda (2003). A total of 536 (76.57%) questionnaires were found fully filled up, which were primarily considered for analysis. After conducting the Mahalanobis Distance Test, 15 responses were removed, ranging from 15.857 to 28.252, and finally, 521 (74.43%) responses were considered for analysis ranging from 0.194 to 14.858. Sekaran (2003) suggested that if the total population size is more than 75,000, a minimum of 384 samples would be required for most research. Roscoe (1975) recommended that a minimum of thirty samples are necessary for each subsample if the samples be broken into subsamples. For multivariate research, he also preferred the sample size of "ten times or more as large as the number of variables" (Sekaran, 2003, p. 295). The study conducted a path analysis where one dependent and five independent variables. The sample size of 521, including 437 students, 52 researchers and 32 teachers, is suitable for multivariate analysis, which has fulfilled the criteria of Sekaran (2003) and Roscoe (1975).

*Demographic information*

The demographic information of the 521 respondents demonstrated that the majority respondents were from the University of Dhaka (133, 25.5%), followed by the University of Rajshahi (68, 13.1), Bangladesh University of Engineering and Technology (67, 12.9%), Sher-e-Bangla Agricultural University (57, 10.9%), Chittagong University of Engineering and Technology (53, 10.2%), Shahjalal University of Science and Technology (42, 8.1%),

Bangladesh University of Professionals (35, 6.7%), Khulna University of Engineering and Technology (34, 6.5%), and Chittagong Veterinary and Animal Sciences University (32, 6.1%). The more significant proportion of the respondents were students (437, 83.9%), followed by researchers (52, 10%) and teachers (32, 6.1%). Among the responses, 3 (0.6%) were from professors, 7 (1.3%) were from associate professors, 13 (2.5%) were from assistant professors, 11 (2.1%) were from lecturers, 52 (10%) were from MPhil/PhD researchers, 137 (26.3%) were from post-graduate students and 298 (57.2%) were from undergraduate students. Among the respondents, 173 (33.2%) were female, and 448 (66.8%) were male. Thus, the demographic information of the sample appears that a large number of the diversified population responded.

*Data assessment methods*

The SPSS 22 was used to measure demographic information, service quality, user satisfaction and exploratory factor analysis. The SEM method was also applied to conduct path analysis, confirmatory factor analysis, and construct reliability and validity by the SmartPLS 3.3.3 to appraise the significant impact of service quality dimensions on user satisfaction.

## Findings

*Reliability*

This study used Bartlett's test of sphericity and Kaiser–Meyer–Olkin (KMO) to validate the sample size's adequacy. The KMO values are 0.854 for resource, 0.906 for competence, 0.865 for responsiveness, 0.922 for demeanor, 0.886 for tangibles, 0.897 for satisfaction, and 0.970 for all items, which are greater than the threshold of 0.7 (Kaiser, 1974; Leech *et al.*, 2005), indicating the 521 samples are statistically adequate to conduct the path analysis. The Bartlett's test values are $p < 0.001$ for overall service quality, $p < 0.001$ for resource, $p < 0.001$ for competence, $p < 0.001$ for responsiveness, $p < 0.001$ for demeanor, $p < 0.001$ for tangible, $p < 0.001$ for satisfaction, and $p < 0.001$ for all items which are less than the threshold of $p < 0.05$ (Schierholz and Laukkanen, 2007), indicating internal consistency of these data is adequate. The Cronbach's alpha coefficient, composite reliability and RHO_A coefficient were applied to investigate the reliability of the data. The alpha values of all items ($\alpha = 0.970$), resource ($\alpha = 0.862$), competence ($\alpha = 0.916$), responsiveness ($\alpha = 0.883$), demeanor ($\alpha = 0.916$), tangible ($\alpha = 0.885$) and satisfaction ($\alpha = 0.882$) were higher than the threshold of 0.7 (Nunnally, 1978), indicating good reliability of overall questionnaire items. The construct reliability values of resources (0.897), competence (0.935), responsiveness (0.915), demeanor (0.935), tangibles (0.911) and satisfaction (0.907) were higher than the threshold of 0.7 (Bagozzi and Yi, 1988) indicated that the internal consistency of all the variables is suitable. The RHO_A coefficient values of resources (0.868), competence (0.919), responsiveness (0.900), demeanor (0.917), tangibles (0.890) and satisfaction (0.901) constructs exceed the value of threshold 0.7 (Dijkstra and Henseler, 2015), indicating all the variables are reliable (Table 1).

*Validity*

After testing the reliability of the data, several statistical methods, i.e. factor analysis, discriminant validity, convergent validity, items loading, commonalities, Pearson correlation and collinearity statistics, were applied to validate the model. The square root of the average variance extracted (AVE) value is greater than the correlations of all reflective variables (Fornell and Larcker, 1981), indicating that discriminant validity exists in the SEM method (Table 2).

Factor analysis showed that all the items were loaded on the factors from 44.862 to 0.409 where the eigenvalue of the Rotation Sums of Squared Loadings was from 44.862 to 2.209 for

six factors which were higher than the threshold of one (Andaleeb and Simmonds, 1998), indicating six variables were significant for conducting path analysis. In addition, the AVE values of resources (0.593), competence (0.705), responsiveness (0.684), demeanor (0.705), tangibles (0.598), and satisfaction (0.555) were higher than the threshold of 0.50 (Bagozzi and Yi, 1988), indicating the convergent validity exists among all the constructs (Table 3).

The items loading of the extracted from variables were shown between 0.701 and 0.878 for 34 items out of 38, indicating that most of the items signify the respective constructs of user satisfaction and service quality. The commonalities of the variables extracted between 0.508 and 0.733 for 35 items out of 38 were higher than the suggested value of 0.5 by Nadiri (1970), indicating that the variance in most items is within an appropriate range. The variance inflation factor (VIF) values of all items were from 1.336 to 2.951, and six variables were from 2.181 to 4.645, which were within the recommended values of $1 < \text{VIF} < 5$ by Minitab.com (2019), indicating there is a strong correlation existed between the variables as well as there are no multicollinearity problems in the SEM (Table 4).

Table 5 shows a very strong correlation ($p < 0.01$) among the variables where user satisfaction is positively and significantly correlated with resources, competency, responsiveness, demeanor and tangible. Moreover, the highest value of Pearson correlation between responsiveness and competence is 0.826, which is less than the suggested value of 0.90, alleviating the multicollinearity concern of the five variables (Hair *et al.*, 2010).

*Fitness of the model*

The study further applied confirmatory factor analysis with the SEM to evaluate whether the conceptual model fits. The SRMR value (0.050) is less than the threshold of <0.08 (Hu and Bentler, 1998), indicating that the conceptual model has the goodness of fit. The NFI value (0.902) is greater than the threshold of >0.9 (Hu and Bentler, 1998), which supported the goodness of the model fit. The RMS_Theta value (0.106) is less than the threshold of <0.12 (Bentler and Bonett, 1980), indicating a well-fitting model (Table 6).

**Table 1.** Sampling adequacy and reliability

| Dimensions<br>Significant level | KMO value<br>*Sig: 0.7 or above* | Bartlett's test of sphericity<br>*Sig: 0.05 or less* | Cronbach's alpha<br>*Sig: 0.7 or greater* | Composite reliability<br>*Sig: 0.7 or greater* | RHO_A<br>*Sig: 0.7 or greater* | Items |
|---|---|---|---|---|---|---|
| Resource | 0.854 | 0.001 | 0.862 | 0.897 | 0.868 | 6 |
| Competence | 0.906 | 0.001 | 0.916 | 0.935 | 0.919 | 6 |
| Responsiveness | 0.865 | 0.001 | 0.883 | 0.915 | 0.900 | 5 |
| Demeanor | 0.922 | 0.001 | 0.916 | 0.935 | 0.917 | 6 |
| Tangibles | 0.886 | 0.001 | 0.885 | 0.911 | 0.890 | 7 |
| Satisfaction | 0.897 | 0.001 | 0.882 | 0.907 | 0.901 | 8 |
| Overall | 0.970 | 0.001 | 0.970 | | | 38 |

**Table 2.** Discriminant validity by Fornell–Larcker criterion

| | Competence | Demeanor | Resources | Responsiveness | Satisfaction | Tangibles |
|---|---|---|---|---|---|---|
| Competence | *0.840* | | | | | |
| Demeanor | 0.777 | *0.840* | | | | |
| Resources | 0.672 | 0.644 | *0.770* | | | |
| Responsiveness | 0.830 | 0.823 | 0.690 | *0.827* | | |
| Satisfaction | 0.680 | 0.693 | 0.604 | 0.687 | *0.745* | |
| Tangibles | 0.693 | 0.771 | 0.655 | 0.734 | 0.691 | *0.773* |

| Component | Initial eigenvalues | | | Rotation sums of squared loadings | | |
|---|---|---|---|---|---|---|
| | Total | % Of variance | Cumulative % | Total | % Of variance | Cumulative % |
| 1 | 44.862 | 48.355 | 48.355 | 44.862 | 48.355 | 48.355 |
| 2 | 4.544 | 4.898 | 53.253 | | | |
| 3 | 3.981 | 4.291 | 57.544 | | | |
| 4 | 3.559 | 3.836 | 61.380 | | | |
| 5 | 2.428 | 2.617 | 63.997 | | | |
| 6 | 2.209 | 2.380 | 66.377 | | | |
| 7 | 2.095 | 2.258 | 68.635 | 4.544 | 4.898 | 53.253 |
| 8 | 1.954 | 2.106 | 70.742 | | | |
| 9 | 1.786 | 1.925 | 72.667 | | | |
| 10 | 1.694 | 1.826 | 74.492 | | | |
| 11 | 1.643 | 1.771 | 76.263 | | | |
| 12 | 1.329 | 1.433 | 77.696 | | | |
| 13 | 1.288 | 1.388 | 79.084 | 3.981 | 4.291 | 57.544 |
| 14 | 1.210 | 1.304 | 80.388 | | | |
| 15 | 1.192 | 1.285 | 81.673 | | | |
| 16 | 1.132 | 1.220 | 82.893 | | | |
| 17 | 1.077 | 1.161 | 84.054 | | | |
| 18 | 1.054 | 1.136 | 85.190 | 3.559 | 3.836 | 61.380 |
| 19 | 1.006 | 1.084 | 86.274 | | | |
| 20 | 0.967 | 1.042 | 87.316 | | | |
| 21 | 0.943 | 1.016 | 88.333 | | | |
| 22 | 0.905 | 0.975 | 89.308 | | | |
| 23 | 0.868 | 0.936 | 90.244 | | | |
| 24 | 0.843 | 0.909 | 91.153 | 2.428 | 2.617 | 63.997 |
| 25 | 0.781 | 0.842 | 91.995 | | | |
| 26 | 0.719 | 0.775 | 92.770 | | | |
| 27 | 0.693 | 0.747 | 93.517 | | | |
| 28 | 0.670 | 0.722 | 94.239 | | | |
| 29 | 0.647 | 0.698 | 94.937 | | | |
| 30 | 0.628 | 0.677 | 95.614 | | | |
| 31 | 0.592 | 0.638 | 96.252 | 2.209 | 2.380 | 66.377 |
| 32 | 0.591 | 0.637 | 96.889 | | | |
| 33 | 0.565 | 0.609 | 97.498 | | | |
| 34 | 0.518 | 0.558 | 98.057 | | | |
| 35 | 0.494 | 0.532 | 98.589 | | | |
| 36 | 0.462 | 0.498 | 99.087 | | | |
| 37 | 0.438 | 0.473 | 99.559 | | | |
| 38 | 0.409 | 0.441 | 100.000 | | | |

**Table 3.**
Factor analysis with constrained six factors

*Service quality and user satisfaction*

The survey findings show that the overall mean of service quality was 4.29 on a 7-point scale, indicating the service quality is reasonably well in the public university libraries of Bangladesh. Among the five dimensions of service quality, tangibles facilities of the libraries achieved the top service performance score (4.41), followed by competency (4.37), demeanor (4.30), responsiveness (4.28) and resources (4.09) of the libraries. The satisfaction mean was 4.70, indicating the library users ensured favorable satisfaction with the service provided by their libraries (Table 6).

*Impact of service quality dimensions on user satisfaction through SEM*

Finally, SEM was conducted to examine whether the hypotheses are significant. The overall $F$-statistic $F(5,515 = 131.619, p < 0.001)$ indicating the whole model was identified as

| Dimensions | ID | Items | Item loading *Sig: >0.7* | Communalities *Sig: >0.5* | VIF Sig: 1–5 | AVE *Sig: >0.5* |
|---|---|---|---|---|---|---|
| Resource | R1 | Library resources adequately cover your field of study | 0.774 | 0.581 | 2.181 | 0.593 |
| | R2 | Library resources are updated | 0.807 | 0.620 | | |
| | R3 | Resources are conveniently accessible | 0.786 | 0.580 | | |
| | R4 | Digital Institutional Repository is rich | 0.802 | 0.658 | | |
| | R5 | The online catalog of your library is easy to understand | 0.753 | 0.545 | | |
| | R6 | Easy access to subscribed online resources | 0.691 | 0.508 | | |
| Competence | C7 | Library staff are knowledgeable to answer your query | 0.814 | 0.594 | 3.686 | 0.705 |
| | C8 | Library staff provide services as promised | 0.865 | 0.693 | | |
| | C9 | Library staff are skillful at providing library information literacy accurately | 0.867 | 0.675 | | |
| | C10 | Services are provided with minimum interruption | 0.812 | 0.598 | | |
| | C11 | Users feel relaxed when interacting with library staff | 0.838 | 0.692 | | |
| | C12 | Library staff have the ability to guide users properly | 0.842 | 0.681 | | |
| Responsiveness | RP13 | Library staff have the willingness to help users | 0.867 | 0.718 | 4.645 | 0.684 |
| | RP14 | Giving priority to the user's interest | 0.878 | 0.679 | | |
| | RP15 | Library staff serve promptly to the users | 0.873 | 0.644 | | |
| | RP16 | Library staff inform users regularly regarding the current progress of the library | 0.701 | 0.558 | | |
| | RP17 | Library staff are always available in the library to help users | 0.803 | 0.594 | | |
| Demeanor | D18 | Library staff are always polite, showing friendly behavior | 0.836 | 0.677 | 4.029 | 0.705 |
| | D19 | Library staff are giving individual attention to meet research needs | 0.838 | 0.595 | | |
| | D20 | Library staff deal with users in a considerate manner | 0.839 | 0.634 | | |
| | D21 | Library staff understand the needs of the users | 0.868 | 0.672 | | |
| | D22 | One can make suggestions or complaints easily about any issue of the library | 0.813 | 0.584 | | |
| | D23 | Readiness for responding to user queries | 0.843 | 0.652 | | |

(*continued*)

**Table 4.**
Item loading, communalities, VIF and AVE values

| Dimensions | ID | Items | Item loading *Sig: >0.7* | Communalities *Sig: >0.5* | VIF Sig: 1–5 | AVE *Sig: >0.5* |
|---|---|---|---|---|---|---|
| Tangibles | T24 | The library has a suitable space that encourages study and learning | 0.762 | 0.556 | 2.854 | 0.598 |
| | T25 | The internal environment is calm, welcoming and conducive to study | 0.789 | 0.616 | | |
| | T26 | The library is fully automated | 0.790 | 0.681 | | |
| | T27 | The appearance of the library staff is appealing | 0.802 | 0.635 | | |
| | T28 | Sufficient knowledge management tools are available in the library | 0.844 | 0.733 | | |
| | T29 | The library website contains the necessary information | 0.804 | 0.676 | | |
| | T30 | Convenient library hours (opening and closing hours) | 0.595 | 0.337 | | |
| Satisfaction | S31 | The library has adequate resources which are satisfactory | 0.742 | 0.582 | | 0.555 |
| | S32 | I am satisfied with the library staff's ability to perform promised services | 0.844 | 0.661 | | |
| | S33 | Library staff have the willingness to help users promptly | 0.842 | 0.686 | | |
| | S34 | The caring performance of the library staff satisfy individual users | 0.840 | 0.640 | | |
| | S35 | The physical environment of the library is satisfactory | 0.716 | 0.511 | | |
| | S36 | I would like to use the library in future | 0.573 | 0.479 | | |
| | S37 | I would like to share about the services of the library to others | 0.576 | 0.459 | | |
| | S38 | Considering as a university library, the quality of service is excellent | 0.764 | 0.556 | | |

**Table 4.**

| | Mean | SD | Resource | Competence | Responsiveness | Demeanor | Tangibles | Satisfaction |
|---|---|---|---|---|---|---|---|---|
| Resource | 4.09 | 1.19 | 1 | | | | | |
| Competence | 4.37 | 1.32 | 0.669** | 1 | | | | |
| Responsiveness | 4.28 | 1.31 | 0.696** | 0.826** | 1 | | | |
| Demeanor | 4.30 | 1.32 | 0.644** | 0.777** | 0.821** | 1 | | |
| Tangibles | 4.41 | 1.27 | 0.653** | 0.690** | 0.734** | 0.768** | 1 | |
| Satisfaction | 4.70 | 1.07 | 0.594** | 0.666** | 0.667** | 0.681** | 0.683** | 1 |

**Note(s):** **Correlation is significant at the 0.01 level (2-tailed)

**Table 5.**
Means, standard deviations and Pearson correlation

significant. The Multiple $R$ ($R = 0.745$) is greater than the criteria ($R > 0.50$) of Cohen *et al.* (2003), indicating the relationship between independent and dependent variables was identified as strong. The adjusted $R^2$ value ($R^2 = 0.58$) indicating the SEM model explained that 58% of the total variation could be influenced by the libraries' resources, competence, demeanor, responsiveness and tangible facilities on user satisfaction (Figure 1).

Table 7 shows the hypothesized path, path coefficient ($\beta$), sample mean (SM), standard deviation (SD), $t$ value, probability values ($p$) and decisions of the hypotheses. The results of regression coefficient ($\beta$) value, $p$-value and $t$-value suggested that resources ($\beta = 0.111$, $t = 2.462$, $p < 0.014$), competence ($\beta = 0.192$, $t = 2.939$, $p < 0.003$), demeanor ($\beta = 0.175$, $t = 2.694$, $p < 0.007$) and tangibles ($\beta = 0.272$, $t = 5.131$, $p < 0.001$) facilities of the libraries have the significant positive impact on user satisfaction in Bangladeshi public university

| Goodness of fit | Saturated model | Estimated model | Cut off value | Model evaluation |
|---|---|---|---|---|
| SRMR | 0.050 | 0.050 | <0.08 | Good Fit |
| d_ULS | 1.872 | 1.872 | | |
| d_G | 0.749 | 0.749 | | |
| Chi-Square | 2229.103 | 2229.103 | | |
| NFI | 0.902 | 0.902 | >0.9 | Good Fit |
| RMS Theta | | 0.106 | <0.12 | Good Fit |

**Table 6.**
CFA model fit indices

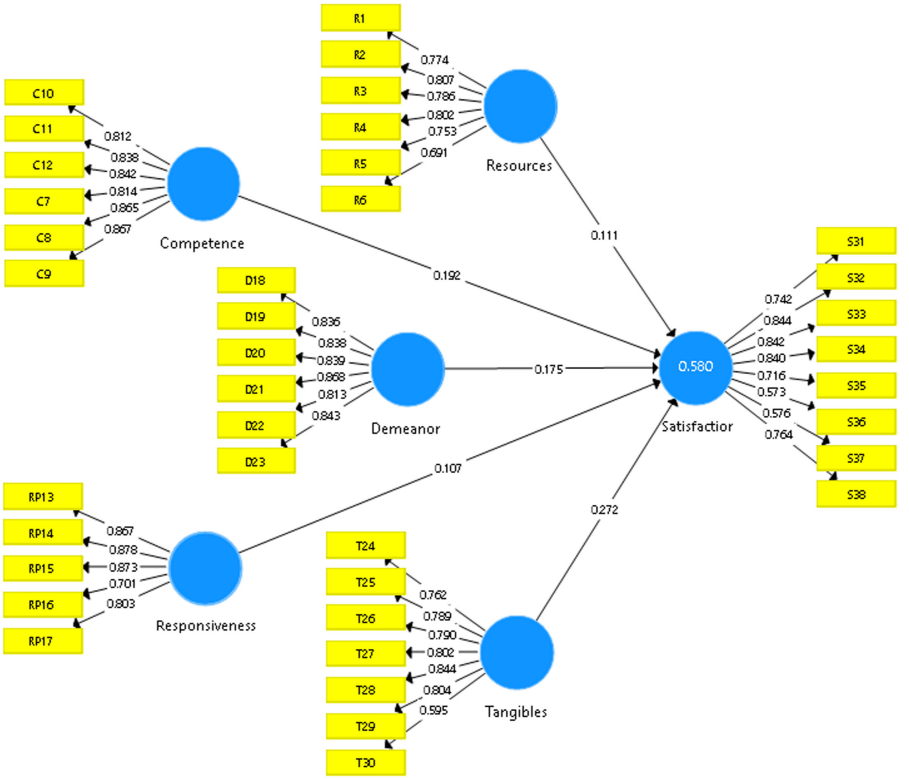


**Figure 1.**
Structural equation modeling

libraries. Besides, the staffs' responsiveness ($\beta = 0.107, t = 1.620, p < 0.106$) had no significant impact on user satisfaction. The Standardized Coefficients Beta values recommended that tangible facilities ($\beta = 0.272$; $p < 0.001$) of the public university libraries had the most significant impact on user satisfaction, followed by competence ($\beta = 0.192$, $p > 0.003$) of library staff, demeanor ($\beta = 0.175$, $p > 0.007$) of library staff and resources ($\beta = 0.080$; $p < 0.005$) of the libraries.

## Discussion

The study assessed the impact of service quality dimensions on user satisfaction in the public university libraries of Bangladesh developing an SEM method, including 38 items under six variables of service quality and satisfaction from SERVQUAL, LibQUAL and SERVPERF literature applying a 7-point Likert scale. This model was adapted as per the arrangements of university libraries and consulting with some LIS researchers, including both professionals and academicians, as well as validated it applying several statistical methods. The respondents' demographic information recommended that a large number of the diversified population responded. The KMO values indicating the 521 samples are statistically adequate to conduct the path analysis. Bartlett's test values indicating the internal consistency of these data are suitable. Factor analysis indicated six variables were significant for conducting path analysis. The square root of AVE indicates that discriminant validity has existed in the model. The items loading of extracted variables indicated that most items represent the respective independent and dependent variables. The commonalities of the variables indicating the variance in most items are within an appropriate range. The AVE values recommended that the convergent validity has existed among all the variables. Both Pearson correlation and VIF values of all variables indicated a strong correlation between the variables, and there is no multicollinearity problem in the SEM model. Moreover, the SRMR, NFI and RMS Theta values supported the goodness of the model fit. From the above discussion, it can be concluded that the model was recognized as a goodness of fit, and numerous statistical methods support the sampling adequacy, reliability and validity.

This SEM was identified as significant ($p < 0.001$), that produced a relevant result to the researches by Alam (2021), Wala *et al.* (2020), Farooq *et al.* (2019), Long *et al.* (2019), Kandie (2018), Wibisono *et al.* (2018), Bae and Cha (2015), Suki and Suki (2013), Wang and Shieh (2006), Simmonds and Andaleeb (2001), and Andaleeb and Simmonds (1998). Moreover, the library resources ($p < 0.014$) significantly influenced satisfaction that was a similar result to the researches by Alam (2021), Bae and Cha (2015), Simmonds and Andaleeb (2001), and Andaleeb and Simmonds (1998) as well as dissimilar result to the study by Wala *et al.* (2020). The library users have given significant importance to the library staff's competency ($p < 0.003$), which was a related result to the research by Wala *et al.* (2020) as well as a different result to the researches by Alam (2021), Simmonds and Andaleeb (2001), and Andaleeb and Simmonds (1998). The library staffs' demeanor ($p > 0.407$) approach significantly influenced

**Table 7.**
SEM hypotheses

| Hypotheses | Hypothesized paths | $\beta$ | SM | SD | $t$ Sig. >1.96 | $p$ Sig. <0.05 | Decisions |
|---|---|---|---|---|---|---|---|
| H1 | Resources → Satisfaction | 0.111 | 0.110 | 0.045 | 2.462 | 0.014 | Significant |
| H2 | Competence → Satisfaction | 0.192 | 0.200 | 0.065 | 2.939 | 0.003 | Significant |
| H3 | Responsiveness → Satisfaction | 0.107 | 0.106 | 0.066 | 1.620 | 0.106 | Not Significant |
| H4 | Demeanor → Satisfaction | 0.175 | 0.170 | 0.065 | 2.694 | 0.007 | Significant |
| H5 | Tangibles → Satisfaction | 0.272 | 0.271 | 0.053 | 5.131 | 0.000 | Significant |

user satisfaction, which was a similar result to the study by Andaleeb and Simmonds (1998), as well as a dissimilar result to the researches by Alam (2021) and Simmonds and Andaleeb (2001). The tangible facilities ($p < 0.001$) of the libraries had a significant positive impact on user satisfaction, which was a relevant result to the researches by Alam (2021), Wala *et al.* (2020), Farooq *et al.* (2019), Kandie (2018), Suki and Suki (2013), Wang and Shieh (2006), and Simmonds and Andaleeb (2001). The study found that the library users have given insignificant importance to the library staffs' responsiveness quality ($p > 0.106$) which was a similar result to the studies by Alam (2021), Kandie (2018), Wang and Shieh (2006), Simmonds and Andaleeb (2001), and Andaleeb and Simmonds (1998) as well as dissimilar results to the researches by Long *et al.* (2019) and Wibisono *et al.* (2018).

*H1: Resources in the university libraries of Bangladesh positively influence user satisfaction*
The standardized coefficients beta value ($\beta = 0.111, p < 0.014$) suggested that the resources of Bangladeshi public university libraries had the fourth significant impact on user satisfaction. The coefficients beta value of the resources is 0.111, indicating that if the resources of the libraries are increased by 1%, the level of user satisfaction is expected to increase by 1.11%. Resource strategy is essential because teachers, students and researchers frequently use academic libraries to meet their academic needs. Moreover, in the contemporary global environment, resources do not only mean the physical collections of a library; rather, they incorporate a variety of electronic resources that can be accessed offline or online. Therefore, library authorities should play a constructive role in budding diversified information access considering their users' expectations.

*H2: Competent service of the library staff positively influences user satisfaction*
The standardized coefficients beta value ($\beta = 0.192, p < 0.003$) recommended that competent service of the library staff had the second height significant impact on satisfaction in public university libraries of Bangladesh. The coefficients beta value of the competence variable is 0.192, indicating that if the competent service of the library staff is increased by 1%, the level of user satisfaction is expected to increase by 1.92%. Therefore, though implementing the competence quality among library staff would be tough, they should focus on their competent service that satisfies their users.

*H3: Responsiveness of the library staff positively influences user satisfaction*
The result ($\beta = 0.107, p < 0.106$) suggested that the library users did not show significant importance to the library staff's responsiveness quality. The coefficients beta value of the responsiveness variable is 0.107, indicating if the service with the responsiveness of the library staff is increased by 1%, the level of user satisfaction is expected to increase by 1.07%, but which is recognized as an insignificant positive effect. Library users expect such kinds of professionals who are friendly and approachable but not unnecessarily intrusive. It is assumed that when library professionals express appropriate responsiveness in delivering services, it may not be noticed, but when library professionals show underprivileged responsiveness, users may notice this, and their satisfaction level may be declined. Thus, the library staff should not give less importance to the responsiveness quality in providing services to their users and should avoid unnecessarily intrusive.

*H4: Demeanor approach of the library staff positively influences user satisfaction*
The standardized coefficients beta value ($\beta = 0.175, p < 0.007$) recommended that the library users have given third height significant importance to the library staffs' demeanor approach in the public university libraries of Bangladesh. The coefficients beta value of the demeanor

variable is 0.175, suggesting that if the demeanor approach of the library staff is increased by 1%, the level of user satisfaction is expected to increase by 1.75%. Though adopting the quality of demeanor approach among library staff can be challenging, the library professionals should emphasize the demeanor approach in delivering services that will increase the satisfaction level of their users.

*H5: Tangible facilities of the libraries positively influence user satisfaction*

The standardized coefficients beta value ($\beta = 0.272$, $p < 0.001$) recommended that the library's physical facilities had the top significant impact on user satisfaction, indicating the library's tangible facilities play a significant role in increasing the satisfaction level of their users. Furthermore, the coefficients beta value of the tangibles variable is 0.272, indicating that if the tangibles facilities of the libraries are increased by 1%, the level of user satisfaction is expected to increase by 2.72%. Therefore, the library staff should emphasize increasing the tangible facilities and maintaining the libraries in an excellent environment to satisfy users.

## Conclusion

This study investigated which service quality dimensions influenced user satisfaction in Bangladeshi public university libraries from the viewpoint of teachers, students and researchers. Numerous statistical methods indicated that the goodness of model fit, sampling adequacy, reliability and validity have existed in the model that produced a relevant result to the existing literature. The study found that library users were satisfied with the services offered by their university libraries, and their satisfaction level was rationally well. Furthermore, the SEM method was recognized as significant and indicating the resources, competence, demeanor, and tangibles facilities significantly influenced user satisfaction in the Bangladeshi public university libraries.

In the age of globalization, the library authorities should emphasize maintaining standard physical facilities in the Bangladeshi public university libraries as the users have given supreme importance to the tangibles facilities. Though implementing the competence quality and demeanor approach among library staff would be challenging, library professionals should give attention to these qualities in providing services as identified respectively second and third significant factors. Library authorities should emphasize the library resources procurement according to user expectations and play a proactive role in budding diversified and expanded information access facilities because the users ranked resources as a vital factor where their level of satisfaction with the factor was the lowest among the five factors.

The SEM approach has significant implications for promoting future researches and practices in academic libraries. The research findings would be helpful for the university library authorities to plan and execute user expected library services. For the first time, an initiative has been taken to appraise the impact of service quality dimensions on user satisfaction in the university libraries of Bangladesh using SEM, which has contributed to fulfilling the research gaps concerning library service quality and user satisfaction. Thus, more studies would be necessary to make it an efficient model that may help to produce more relevant and appropriate results.

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