

Service Quality Methods and Practices to Improve Library Administration: A Pilot Study

Chao-Chung Ho ¹, Yi-Horng Lai ² and Ming-Shu Chen ^{2,*} 

¹ School of Mathematics and Statistics, Shaoguan University, Shaoguan 512005, China

² Department of Healthcare Administration, College of Healthcare and Management, Asia Eastern University of Science and Technology, New Taipei City 220303, Taiwan

* Correspondence: tree@mail.aeust.edu.tw or tree1013@gmail.com; Tel.: +886-2-7738-8000 (ext. 6223); Fax: +886-2-7738-0898

Abstract: The aim of this study is to identify the differentiated services university libraries are able to offer students by prioritizing service quality factors using the various dimensions and factors of service quality. The paper proposes a study that adopts the Parasuraman, Zeithaml, and Berry (PZB) service quality model to construct a model for measuring the service quality of a university library. The study conducts analysis using an expert questionnaire and the Analytic Hierarchy Process (AHP) to identify students' needs with respect to the library's service quality. This study covered 44 different graduate institutes, but it is aimed at postgraduate student-oriented university libraries, which may not reveal the real status of different types of libraries. The five dimensions of service quality identified in this study by order of importance are responsiveness, tangibility, reliability, assurance, and empathy. The first three criteria of the twenty-two assessment criteria are "The staff is unwilling to help students", "The library's facilities match up with the type of services" and "Students are unable to receive fast services from staff". This article seeks to provide innovative methods for previous library management in the university library and the research results could also provide useful references with social implications and novel value to the university library's management team to improve the library's service quality.

Keywords: service quality; Parasuraman, Zeithaml and Berry (PZB); analytic hierarchy process (AHP); university library



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1. Introduction

Given the liberalization of Taiwan's educational system in recent years, there has been a marked increase in the number of universities. In 2021, there were a total of 149 universities, accommodating a total of 1,185,830 enrollees [1]. The number of students enrolled in universities is over 400,000 more than it was in 1998. Given the knowledge demands of contemporary society, there is a corresponding boom in the population of postgraduate students (masters and PhDs) following the massive increase in the number of universities in Taiwan. The increase in educational resources has contributed to a heightened willingness among students to undertake postgraduate study. Due to a higher demand for library services by postgraduate students, it is vital for university libraries to find ways of improving usage efficiency and service quality. The improvement of service quality by university libraries is a continuous endeavor, and some universities even go as far as obtaining ISO 9001 certification with the objective of offering students better services. The main objective of this study is to identify the key criteria factors that contribute to the service quality of university libraries and to determine which criteria factors are most important to library customers. In addition, this study aims to provide recommendations for improving library services based on the identified criteria factors. We have included a more detailed explanation of these aims in the Introduction section

of our research. Specifically, we highlight the importance of understanding the needs and preferences of library users in order to provide high-quality services that meet their expectations. Our findings will have implications for the development of library services and the enhancement of user satisfaction. The PZB service quality model and an expert questionnaire were used to identify assessment measures appropriate to construct the library service quality model required in this study [2]. The aim is to understand the critical factors pertaining to each of the services provided by university libraries. Critical factors by order of importance are obtained through analysis of the results, which are used as a guideline to improve university libraries' service quality. The optimal goal is to improve students' satisfaction levels and willingness to reuse the service. Currently, due to the declining birth rate in Taiwan, some universities are facing operational difficulties. In order to enhance the service quality of schools, this study focuses on the quality of services provided by university libraries and aims to understand the level of services that students receive in these libraries. This study made three main contributions. First, it analyzed students' needs regarding library service quality using an expert questionnaire and the Analytic Hierarchy Process (AHP). Second, it identified the five dimensions of service quality in order of importance, namely, responsiveness, tangibility, reliability, assurance, and empathy. Finally, the study's results may serve as a useful reference for university academic library management teams seeking to improve service quality. The reason why we use the AHP in this study is to quickly establish the hierarchy of elements and further clarify the relevant relationships between each level, criterion, and element.

1.1. Library Service Quality

The university library is a place where books and educational resources are housed and where teaching staff, employees, and students can access resources. Due to rapid developments in information, the university library no longer serves the mere functions of book loans or a place to study. A modern-day library offers very diverse information services. Librarians now offer proactive services as compared to the passive services of the past.

The resources of a library are not restricted to its tangible functions. Library services may also be facilitated through tools such as computers and internet services. Numerous studies on the service quality of libraries may be found both locally and internationally. Shi and Levy focused on the review of research concepts of service quality, customer/user satisfaction, and their applications in library assessment activities [3]. Chang et al. pointed out that libraries emphasizing service quality increased user satisfaction [4]. Nitecki and Hsieh undertook a study on interlibrary collaboration, reference services, and teacher-designated reference book services [5]. Herbert investigated students' expectations and recognition of interlibrary loans [6]. Martensen and Gronholdt found that a library's service quality has positive effects on students' awareness [7]. Wang and Shieh, taking Christian University Library as an example, they investigated the users' degree of importance they gave to the library and the performance provided by the library in Taiwan [8]. Chen and Chen studied the satisfaction and willingness of students to reuse the service based on the service quality of libraries [9]. Kingdom and Baro imported automation projects and applied library software to enhance the search functions in use in Nigerian university libraries [10]. Liu and Ding investigated the feasibility of university libraries in providing research data management (RDM) services without any supporting policies from governments or funding agencies at Wuhan University in China [11]. Aiguo introduced the concept of Science and Technology Novelty Search (S&TNS), a special information consultation service. A quality control model to improve the quality of service of S&TNS at a Chinese University was outlined [12]. Zhang studied and presented the library's electronic resources based on LibQUAL+ and Kano to discern the influencing factors [13]. Guohong and Qing based their study on the existing evaluation theory of quality and the method of mobile service quality and mobile library service quality [14]. Cristobal's research indicated that there is a significant direct relationship between library service quality and customer satisfaction [15].

McCaffrey conducted a retrospective analysis of LibQUAL+ from 2007 to 2016 to explore how users responded to changes and to the gradual transformation of the library [16]. Mandrekar found that libraries play an important role in students' academic success and performance [17]. Mahmood et al. researched developing countries and evaluated the library service quality of college libraries [18]. Chen et al. used a fuzzy Delphi method to establish questionnaire indices and the attributes of library service quality elements using the Kano model [19].

Unlike other related studies that use questionnaires, this study employed an expert interview method to develop a questionnaire. The interviewees were high-level library executives, including library directors, acquisition and cataloging department heads, collection and reading department heads, reference service department heads, and digital information department heads. The main purpose of these interviews was to gain insight into the library's basic customer needs and the challenges faced by the library from a management perspective within the library department.

In addition, this study employed the Analytic Hierarchy Process (AHP) to quickly establish the hierarchy of criteria and further clarify the relationships between each level, dimensions, and criterion. The AHP model simplified the evaluation process and provided a simple and understandable calculation process. It also effectively illustrated the importance of each element.

1.2. Analytic Hierarchy Process (AHP)

The Analytic Hierarchy Process (AHP) model, designed by Saaty in 1970, is a structured technique to deal with complex decisions [20]. The AHP model is present in previous literature concerning library studies. An AHP-based evaluation model was set up to assess library service quality, following which the model was adapted to assess the service quality of Nanjing Agricultural University Library [21]. Chen's research showed that fuzzy analytic hierarchy is an effective method of evaluating the personalized service level of a library [22]. A conceptual framework based on the Analytic Hierarchy Process model is proposed to identify the priority of the main decision criteria and sub-criteria concerning library service quality among undergraduate students [23].

2. Materials and Methods

2.1. Questionnaire Design

The study uses the PZB service quality scale "SERVQUAL" as the foundation of the study. Through interviews with library management and making the required amendments, we have drawn out five hierarchical dimensions and twenty-two assessment criteria (four for tangibility, five for reliability, five for authenticity, four for assurance, and four for empathy) with respect to a library's management strategy.

2.2. Research Framework

The research framework was fundamentally based on the conceptual service quality model developed by Parasuraman et al. [24] and consists of the revised SERVQUAL service quality scale. References were also made to past local and international literature on the service quality of libraries. The research framework was constructed in line with the motives and purposes of this study, dividing libraries' service quality into five major dimensions, namely, tangibility, authenticity, responsiveness, empathy, and communication. Each dimension comprises different service quality assessment criteria. The five dimensions of SERVQUAL were tested for four department stores using fuzzy set theory to clarify the positioning of service quality in the department store market and propose implementation priorities for different service strategies [25].

2.3. Analytic Hierarchy Process

The AHP is a structured technique designed by Saaty in 1980 to deal with complex decisions [26]. The AHP essentially simplifies a complex problem evaluation system into a

simple hierarchical system of sub-problems or factors. The analytical procedures may be divided into the following phases:

- (1) Define problem and evaluation factors and decompose them into a hierarchy.
- (2) Set up the pairwise comparison matrix.

The values of relative importance among the factors obtained from the survey are used to construct the pairwise comparison matrix. By setting up C_1, C_2, \dots, C_n under the same set of factors, quantitative judgments of paired factors C_i and C_j may be expressed as the $n \times n$ matrix, as shown in Formula (1) below. In matrix \mathbf{A} , value $a_{ji} = 1/a_{ij}$ ($i, j = 1, 2, \dots, n$) represents the relative importance judgment of the paired factors (C_i, C_j). On the other hand, W_1, W_2, \dots, W_n represents the quantitative weighting of the n th factor C_1, C_2, \dots, C_n . The relationship between the weights and a_{ij} is shown as $W_i/W_j = a_{ij}$ ($i, j = 1, 2, \dots, n$).

$$\mathbf{A} = [a_{ij}] = \begin{matrix} & \begin{matrix} C_1 & C_2 & \dots & C_n \end{matrix} \\ \begin{matrix} C_1 \\ C_2 \\ \dots \\ C_n \end{matrix} & \begin{bmatrix} 1 & a_{12} & \dots & a_{1n} \\ 1/a_{12} & 1 & \dots & a_{2n} \\ \dots & \dots & \dots & \dots \\ 1/a_{1n} & 1/a_{2n} & \dots & 1 \end{bmatrix} \end{matrix} = \begin{matrix} & \begin{matrix} C_1 & C_2 & \dots & C_n \end{matrix} \\ \begin{matrix} C_1 \\ C_2 \\ \dots \\ C_n \end{matrix} & \begin{bmatrix} W_1/W_1 & W_1/W_2 & \dots & W_1/W_n \\ W_2/W_1 & W_2/W_2 & \dots & W_2/W_n \\ \dots & \dots & \dots & \dots \\ W_n/W_1 & W_n/W_2 & \dots & W_n/W_n \end{bmatrix} \end{matrix} \quad (1)$$

- (3) Compute the characteristic value and characteristic vector.

Once the pairwise comparison matrix is set up, the next step is to obtain the weighting for each hierarchical element. Pairwise comparison matrix \mathbf{A} multiplied by the importance vector x equals nx , as shown below:

$$(\mathbf{A} - n\mathbf{I})x = 0 \quad (2)$$

At this time, x is referred to as the characteristic vector, which is the weight or priority based on the subjective judgment of the decision maker when undertaking the a_{ij} pairwise comparison. There exists a certain variance between the true W_i/W_j value and the x value. As such, the hypothesis $\mathbf{A}x = nx$ does not hold. Saaty recommends using the maximum characteristic value from matrix \mathbf{A} , λ_{\max} , in place of n :

$$\lambda_{\max} = \sum_{j=1}^n a_{ij} \frac{W_j}{W_i} \quad (3)$$

When \mathbf{A} is the consistency matrix, the characteristic vector x may be obtained from the following formula:

$$(\mathbf{A} - \lambda_{\max}\mathbf{I})x = 0 \quad (4)$$

- (4) Consistency test.

The purpose of the consistency test is to verify the transitivity of the judgments made in the overall evaluation process to determine if the results of the judgments are valid. In relation to the consistency of the pairwise comparison matrix, Saaty in 1987 suggested verifying this using the Consistency Ratio (CR) [27]. The formula is as follows:

$$CR = CI/RI \quad (5)$$

among which CI is the Consistency Index and

$$CI = (\lambda_{\max} - n)/(n - 1) \quad (6)$$

RI is referred to as the Random Index. The values can be found in Table 1 below.

Table 1. Average Random Index (RI).

Size of Matrix	1	2	3	4	5	6	7	8	9	10
Random consistency	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

3. Results

The objective of the study is to understand the needs of the users of university library services based on a literature review and by conducting an expert survey. The PZB model constructed in this study was used to measure the service quality of libraries, which comprises five major dimensions of service quality. Students were asked to complete the expert questionnaire to find out their needs for library services. The AHP was applied to explore assessment criteria for the management of university libraries. The aim was to identify critical factors for improving the service quality of libraries, to improve students' satisfaction with library services, and to offer directions for library management. The research subjects were from a university in New Taipei City that is one of Taiwan's best research universities. A random sample of respondents was selected from the postgraduate students (one from each graduate institute) of the university for participation in the survey. The university currently comprises 44 graduate institutes, meaning that a total of 44 questionnaires were distributed in the library. The respondents were given a brief explanation prior to filling out the questionnaire, which was then tested for consistency upon completion. Any questionnaire found with inconsistent answers was returned to the respondent for amendment until the consistency principle was satisfied. All 44 questionnaires were collected, representing a 100% response rate. The results of the survey were analyzed using the tool "Expert Choice for Windows" [28] and are depicted in Table 2.

Table 2. Analysis of the weightings of assessment indicators.

Hierarchy I	Assessment Indicators, Hierarchy II	Assessment Indicators, Hierarchy III	Hierarchy Weighting	Test Value
Library service quality factors	Tangibility	Have up-to-date equipment	0.262	CR = 0.02 < 0.1
		Service facilities are appealing	0.179	
		The staff should be well dressed and appear neat	0.147	
		Library's facilities match up with the types of services	0.413	
	Reliability	The library is able to complete services in a timely manner	0.285	CR = 0.01 < 0.1
		When students experience difficulties, the staff should be sympathetic and reassuring	0.231	
		The library is reliable	0.137	
		The staff are able to provide timely services	0.238	
		The staff keep complete service records	0.109	

Table 2. Cont.

Hierarchy I	Assessment Indicators, Hierarchy II	Assessment Indicators, Hierarchy III	Hierarchy Weighting	Test Value
Responsiveness		Students are unable to identify when they will receive the service	0.161	CR = 0.00 < 0.1
		Students are unable to receive fast service from staff	0.230	
		The staff are unwilling to help students	0.425	
		The staff are often too busy to provide immediate services and meet the needs of customers	0.184	
Assurance		The staff are trustworthy	0.144	CR = 0.02 < 0.1
		Students feel secure when using library services	0.184	
		The staff are polite	0.416	
		The staff receive adequate support from the library to deliver good services	0.256	
Empathy		The library does not expect to give students individual services	0.166	CR = 0.02 < 0.1
		The staff are unable to offer students personal attention	0.230	
		It is unrealistic to expect the staff to understand the needs of students	0.140	
		It is unrealistic to expect the library to serve in the best interests of students	0.348	
		The operating hours of the library are inconvenient for students	0.116	

The first hierarchy comprises the main objective, that is, to assess the importance of factors affecting the service quality of libraries. The second hierarchy comprises the following dimensions: tangibility (appropriate planning), authenticity (service), responsiveness (use of books and information), empathy (student services), and communication (added-value services). The 22 assessment criteria drawn up according to the PZB research framework make up the third hierarchy.

Results of the study indicate that library service personnel consider ease of student access to library books and resources and “responsiveness” in accessing services as the most important. “Tangibility” (appropriate planning of library services) is the second most important factor, followed by “authenticity” (staff services) and “empathy” (student services). The least important factor relates to “communication” (other added-value services). Results of the analysis are depicted in Table 3.

Table 3. Overall weighting and order of priority for the assessment indicators.

Hierarchy II	Weight	Sort	Assessment Indicators, Hierarchy III	Overall Weighting	Sort
Tangible	0.244	2	Have up-to-date equipment	0.0639	4
			Service facilities are appealing	0.0437	9
			The staff should be well dressed and appear neat	0.0359	12
			Library's facilities match up with the type of services	0.1008	2
Reliability	0.183	3	The library is able to complete services in a timely manner	0.0522	8
			When students experience difficulties, the staff should be sympathetic and reassuring	0.0432	11
			The library is reliable	0.0251	15
			The staff are able to provide timely services	0.0436	10
			The staff keep complete service records	0.0199	18
Responsiveness	0.346	1	Students are unable to identify when they will receive the service	0.0557	6
			Students are unable to receive fast service from staff	0.0796	3
			The staff are unwilling to help students	0.1471	1
			The staff are often too busy to provide immediate services and meet the needs of customers	0.0637	5
			The staff are trustworthy	0.0183	19
Assurance	0.127	4	Students feel secure when using library services	0.0234	16
			The staff are polite	0.0528	7
			The staff receive adequate support from the library to deliver good services	0.0325	14
			The library does not expect to give students individual services	0.0166	20
Empathy	0.100	5	The staff are unable to offer students personal attention	0.0230	17
			It is unrealistic to expect the staff to understand the needs of students	0.0140	21
			It is unrealistic to expect the library to serve in the best interests of students	0.0348	13
			The operating hours of the library are inconvenient for students	0.0116	22

The library unit, as a non-profit organization, is an institution dedicated to the education of humans and is different from entities and companies dedicated to maximizing profits. Although there are important differences between managing a university and managing a corporation, there are also similarities that can be instructive. For example, both involve serving stakeholders, and students can be thought of as analogous to customers in a business enterprise. Sometimes, the essence of corporate management shall be adopted in the management of the university, that is, to make customer service and

satisfaction part of the mission in order to achieve operational sustainability. As such, this study does not apply the LibQUAL+ service quality scale designed specifically to measure the service quality of libraries [29]. Instead, the SERQUVAL service quality scale used in the context of general corporate situations is applied in this study. The objective is to treat the management of services within the university in the same way as corporations deal with service management. The following discussions are made from the dimension of a corporation.

4. Discussion

4.1. Tangibility (*Appropriate Planning*)

Regarding the dimension of “tangibility”, university libraries are expected to emphasize facilities and resources and make appropriate planning for their use. Results of the survey indicate that the criterion “Library’s facilities match up with the type of service” has the highest priority, followed by “Have up-to-date equipment”. Students expect the school library to offer integrated and well-planned services. For instance, staff handling related services shall be located in the same office to provide one-stop services to students. “Have up-to-date equipment” is also a required feature of library services due to the fact that students spend a long time in the library, and basic facilities such as drinking water dispensers and restrooms should be installed inside the library for easy access. This will increase students’ willingness to utilize library services.

4.2. Reliability (*Service by Library Staff*)

With respect to “reliability”, the assessment criteria in order of their weight are as follows: “The library is able to complete services in a timely manner” is considered the most important, followed by “Ability to provide timely services as promised”. Students are concerned as to whether the university library is capable of delivering timely services. As opposed to public community libraries, the service area of university libraries is a lot smaller and, due to the large number of students, the usage rate is much higher. Peak service hours are fixed during certain times of the day. As such, it is essential that university libraries are capable of offering timely services in line with user demands. “Ability to provide timely services as promised” relates specifically to the library’s ability to provide students with reserved book loan services in a timely manner as often as possible; some books may be in high demand and it is critical that the library maintains accurate control of the returning/loaning of reserved books to satisfy user demands.

4.3. Responsiveness (*Use of Books and Information*)

With respect to “responsiveness”, the criterion “The staff is unwilling to help students” was considered as the most important dimension and was also given the top weight/priority out of the 22 criteria based on the survey results. Evidently, students consider library staff’s willingness to help a critical factor in service quality. Often, students gain good or ill feelings towards library services as a result of the staff’s attitude and enthusiasm to help. On the other hand, “Students are unable to receive fast service from staff” was considered the second most important factor. Students expect to receive faster services when they visit the library.

4.4. Assurance (*Customer Service*)

In relation to “assurance”, top priority is assigned to “The staff are polite”. Students expect the service staff to be patient, caring, enthusiastic, and proactive in providing appropriate, individual services. Students who are able to feel the warmth in services will be more willing to reuse library services. The criterion “The staff receives adequate support from the library to deliver good services” is assigned the second priority, indicating that the respondents consider it important that library staff effectively give directions and rapidly respond to students’ queries. It is important to make sure that the service staff are familiar with their responsibilities when seeking to improve the quality of library services.

4.5. Empathy (Added-Value Services)

On the dimension of “empathy”, the criterion “It is unrealistic to expect the library to serve in the best interests of students” is considered the most important. University libraries, though a non-profit unit, could sometimes benefit from adopting customer service strategies similar to those used by corporations to better serve their students and faculty. As such, some internal departments have become service-oriented, and the primary objective of their communication-related strategies is to serve students.

4.6. Limitations

Due to insufficient research samples, this study is regarded as a “pilot study.” However, the research design not only incorporates quantitative analysis using the AHP, but also adopts the spirit of “qualitative research” to design research questionnaires and conduct survey analysis. Because a large-scale questionnaire survey was not conducted, we suggest increasing the number of survey questions to obtain more opinions in future related studies based on our research results. If there is greater sample size, it is also recommended to conduct sensitivity analysis.

Based on the above discussions, there have been a few recent studies on the application of the AHP in library administration. To report and compare our own research findings, we reviewed several studies that differ from the findings of our study. Ajith et al. used the AHP to minimize the ambiguity and unclearness of human judgments [30]. Firmansyah built a library that can support the capacity of accounting students in higher education [31]. Zheng and Zhao used the AHP to integrate the reading promotion activities of the university library and traditional culture [32]. Fai et al. proposed an Analytic Hierarchy Process model to identify the priority of decision criteria and sub-criteria concerning library service quality among undergraduate students. These studies were added to the Discussion section for comparison and reference [23].

5. Conclusions

In light of the fact that population structure is rapidly changing in contemporary society, the aim of this study is to identify the differentiated services university libraries are able to offer students by prioritizing service quality factors using the various dimensions and factors of service quality. The study attempts to analyze and use the results obtained from the expert questionnaire to understand the service expectation gap of university library services. The results may be used as a reference for future decision making.

Although the importance weighting/priority assigned to each respective service quality assessment criterion (based on the survey results) is consistent with past research, it is important to bear in mind that the target customers in this study are students. As such, future library management policies need to consider the service quality criteria students consider the most important in order to offer services that best suit their needs.

This study covered 44 different graduate institutes, but it was aimed at a postgraduate student-oriented university library in Taiwan, which may not reveal the real status of different types of libraries. However, the study design, method, and results could still serve as a reference to other research university libraries in evaluating the quality of services delivered in Taiwan or other countries.

Finally, we provide the four following recommendations: (1) Results of the study may be used as a reference for the management of university libraries and to understand the types of services required by students. Staff training is essential. It is important for the library to become a sound learning and information communication center. (2) The PZB service quality model is applied as the foundational quality measurement framework in this study. Future researchers may adopt an alternative service quality measurement model. (3) The AHP adopted in this study is practical and is recommended for future study. It is ideal for increasing feedback and for investigating differences between the two. (4) This study focused on the library of a university in Taipei, Taiwan. The respondents comprised

postgraduate students from each graduate institute. The scope of future research may be expanded to include other university libraries.

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