LibQUAL+® based importance-performance matrix analysis for assessing library service quality: A case study

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The main purpose of this study was to measure the strengths and weaknesses of library services using Importance-Performance Matrix Analysis (IPMA). It also intends to identify the critical areas of the library within the three dimensions of LibQUAL+® based on student feedback. Data were collected from students at a private engineering institute in India, using a structured questionnaire to achieve these objectives. Respondents rated the importance and performance of library services on the three dimensions of LibQUAL+®: affect of service (AOS), information control (IC), and library as a place (LP) on a 7-point Likert scale. Analysis was carried out using IPMA to identify the strengths and weaknesses of the library services. The findings suggest that LP was the most essential and well-performing dimension in the library context. IC is the most important, but poorly performing dimension. Therefore, strategies are recommended to ensure the effectiveness of the service. The findings of this study would help library administrators, and policymakers formulate appropriate fund allocation/reallocation based on user requirements. The integration of IPMA and LibQUAL+® in measuring library service quality is a significant contribution of this study to LibQUAL+® literature.

Keywords: LibQUAL+®, importance-performance analysis, service quality, library services

Introduction

Over the last two decades, academicians and library practitioners have recognised the need to assess library services to meet user demands[1], fulfil users' teaching and learning needs, and support institutions' educational goals. Additionally, advances in ICT have enabled libraries to deliver electronic, web-based, and physical services. Therefore, it is necessary to measure the accessibility of information and online services[2] along with the tangible entity of the library. Previous studies have applied two well-known measurement tools to assess library services: SERVQUAL[3, 4] and LibQUAL+®[5,6]. These tools are based on the Expectation Confirmation and Disconfirmation theory, according to which consumers develop a certain level of expectation before they avail of a service. They rate its quality on three levels: minimum, expected and perceived post-service. The differences between the three levels were calculated by subtracting the scores. However, this

method has received criticism from researchers[7], who argued that a novice user of the service would make an unrealistic assessment of expectations and ratings. Further, Carman et al.[8] warned that there might be possibilities of manipulating expectations if the quality is measured after availing of the services.

To address these drawbacks, this study integrates the LibQUAL+® model with the Importance-Performance Matrix (IPM) to evaluate the quality of library services based on student feedback. The IPM approach is used to identify the strengths and weaknesses of services based on consumer feedback. This matrix suggests that consumer satisfaction is driven by two major factors: importance and performance. While "importance" is a term relative to the consumers, "performance" measures the level of implementation of the service variable(s) against expectations. Both factors must be studied collectively to measure consumer satisfaction[9]. The study's outcome can support library service providers in improving and prioritizing service attributes based on

user perceptions. Further, Roszkowski[10] ascertained that perceived rating of service is better than superiority scores to measure satisfaction because consumers can be satisfied even when their expectation levels are not fulfilled[11]. Therefore, this study adopts only perceived performance, along with IPM, to measure the performance of library services.

Review of literature

LibQUAL+®

Since its inception in 2000, LibQUAL+®, developed based on SERVQUAL[12] has evolved into a powerful tool for library professionals to measure, track, and understand the requirements of library users. Like SERVQUAL, LibQUAL+® also seeks to measure service adequacy based on users' responses to a minimum, desired, and perceived level of service quality. A positive adequacy gap suggests that perceived service quality is higher than expectations and vice versa. The gap score indicates the adequacy or shortfall of service levels for all dimensions and their subdimensions. The LibQUAL+® tool consists of three main dimensions and 22 subdimensions. The three dimensions are Affect of Service (AOS), Information Control (IC), and Library as a place (LP).

The first dimension, AOS, comprises nine subdimensions and measures the interaction between library service providers and users. The second dimension, IC, has eight sub-dimensions and concerns the availability of educational resources and access provided to users to use the resources. The third dimension, LP, measures the tangible aspects of the library, such as its premises, facilities, and physical atmosphere, through five subdimensions.

However, despite its proven reliability and validity[13, 14], this tool has been challenged in the past[15]. The most crucial critique is understanding the three different levels of service. Researchers opine that users find it difficult to differentiate between the three levels, resulting in poor or incorrect assessments of services[16]. Edgar stated that administrators could adapt to other methodologies, such as interviews, observation, content analysis, along with LibQUAL+®, to determine the effectiveness of library services[15]. Thus, the present study integrated IPM with LibQUAL+® to measure the quality of library services.

Importance-Performance Matrix Analysis (IPMA)

The IPMA methodology allows service providers to prioritize the characteristics of service attributes by assigning a high priority to the attributes that consumers are unsatisfied with but are otherwise perceived as important. This technique helps identify critical areas of products or services that require improvement. It identifies consumer satisfaction as the utility of two determinants: importance and performance[17]. While performance represents the user's perception of the quality of services delivered, importance refers to the assessment of the importance of those services by the users[18].

As seen in Fig. 1, quadrant I (high importance/low performance) is "Concentrate here," which includes attributes that require immediate attention or corrective action by the service provider. Quadrant II (high importance/high performance) is "keep up the good work" and represents the strength of the service organization. Service providers must maintain the quality of the service attributes. The characteristics mentioned in quadrant III (low importance/low performance) are called "Low priority". These attributes do not threaten the organization, and service providers can focus more on those that need urgent action. Quadrant IV (low importance/high performance) is called "Possible overkill" and includes attributes that have no impact on total customer satisfaction, implying that service providers can reallocate them. This matrix has been successfully used to measure different dimensions of education[19, 20].

Need for the Integration of IPM with LibQUAL+® model

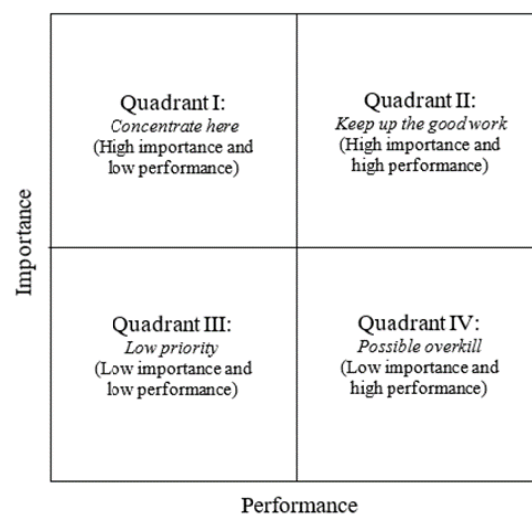Theoretically, LibQUAL+® is based on disconfirmation rather than on an attitudinal paradigm.

Fig. 1 — IPMA Grid (Martilla and James, 1977)

Thus, it fails to draw on established economic, statistical, and psychological theories[21]. While taking a different approach to the expectation measure, Iacobucci opined those expectations might not exist; instead, they may be formed simultaneously during service consumption[22]. Similarly, consumers might form "experience-based norms" after service consumption rather than prior expectations[23]. Another criticism of the gap model is that it fails to capture the dynamics of the changing expectations. Library users' expectations from their initial encounters with the library have changed over time. Moreover, expectations are likely to be influenced by other factors such as users' prior experience, personal needs, and word-of-mouth information from peers or friends.

Further, operationally, the term expectation is polysemic; thus, it is difficult to measure the absolute expectations of service quality. It is also found that the administration of two instruments (expectation and perception) causes boredom and confusion[24]. Additionally, Carman[8] observed that it is not practical to expect respondents to complete an inventory of expectations before a service encounter and an inventory of perceptions immediately afterwards. Furthermore, some researchers from the library service quality discipline found that respondents did not fully understand the three service levels: minimum, desired, and perceived, as asked in the survey[16] and that their gap scores are not constant since respondents' expectations change with experience[10].

Voorbij[25] also showed that LibQUAL+® is not user-friendly, and the libraries that used it in their survey found that the respondents could not complete it. Thus, performance-based measures are recommended to reflect long-term service quality attitudes more accurately[26]. Therefore, it is logical to use IPM and the LibQUAL+® model to evaluate library service quality. The integration of IPM is deemed fit because of its successful adaptation by service quality researchers in the past. For example, it was integrated with SERVQUAL[27, 28], webQUAL 4.0[29], and servicescape[30]. Therefore, the current study integrates IPM with LibQUAL+® items and measures the perception of library users on the importance and performance of library service attributes rather than on the expectation-confirmation basis.

Objectives of the study

- To find out the importance and performance of library service indicators;

- To understand the difference between male and female students' perceptions regarding library services' importance and performance indicators; and

- To investigate the overall strengths and weaknesses of library services.

Methods

This study was conducted at a leading private engineering institute in India. The institute provides undergraduate, postgraduate, and doctoral engineering, basic sciences, and management programmes. The institute has a legacy of over three decades and has been consistently ranked among the top 50 engineering institutes in the country. It houses a multi-story, state-of-the-art library facility with the latest collection of books, research journals, databases, theses, and dissertations in both online and print formats. The library caters to the needs of over 5000 young minds from all over the country and offers one of the best library service facilities in the nation.

Research design and respondents' profile

To achieve these objectives, this study used a modified performance-only version of LibQUAL+® with 22 items under three dimensions: AOS (nine items), IC (eight items), and LP (five items). It also used a purposive sampling technique. Considering the level of maturity and exposure to different library services, only senior students from all disciplines of engineering studies were included in the study. The survey was distributed in classrooms and libraries. The participants were briefed about the purpose of the survey and asked to rate the importance and performance of the different service attributes on a 7-point Likert scale, with 1 representing low and 7 representing high. A total of 515 questionnaires were distributed. After removing incomplete survey questionnaires, 495 responses were used for the final analysis. Of the 495 students, 393 (79.39 %) were undergraduates and 102 (20.61 %) were postgraduates. The sample consisted of 298 male (60.21 %) and 197 female students (39.79 %).

Steps in the IPMA

The following methodology summarises the sequence for developing an IPM.

Step 1: Calculate the mean of the perceived importance scores for the individual item in the questionnaire.

$$\emptyset_p = \sum_{i=1}^{n} \frac{Q_{pi}}{n}$$

Where,

$\emptyset_p$ = Mean of the corresponding item amongst the perceived importance score

Q_{pi} = Likert score of the "i" [th] participant in corresponding perceived importance item

n = Number of participants in the survey

Step 2: Calculate the mean performance score for each item in the questionnaire.

$$\theta_r = \sum_{i=1}^{n} \frac{Q_{ri}}{n}$$

Where,

θ_r = Mean of the corresponding item amongst the present performance scores

Q_{ri} = Likert score of the "i" [th] participant in the corresponding present performance item

n = Number of participants in the survey

Step 3: For every corresponding item in the questionnaire, plot the $\emptyset_p$ and θ_r scores in a scatter plot.

Step 4: Calculate the median of the $\emptyset_p$ and θ_r values and draw the grid lines to divide the scatter plot into quadrants.

In other words, the importance measures of attributes are represented on the vertical axis, whereas the performance measures are represented on the horizontal axis of a two-dimensional graph. Furthermore, this two-dimensional graph is divided into four quadrants based on the median scores of importance and performance, with the quality characteristics classified into four quadrants.

Results and Discussion

Construct reliability and Validity

First, Cronbach's alpha was calculated to measure the reliability of each construct adopted in the study. The reliability tests suggest that all three dimensions of LibQUAL+® are reliable, as Cronbach's alpha is above 0.7, as recommended. Second, convergent and discriminant validity tests were conducted. The results suggest that the measurement model has both convergent and discriminant validities. The square root of the AVE for each construct was greater than the correlation between constructs (Tables 1 & 2).

	Indicators	Item code	Factor Loadings	Cronbach's alpha	CR	AVE
AOS	Instil confidence in users	ASP1	0.503	0.903	0.906	0.521
	Giving users individual attention	ASP2	0.693			
	Consistently courteous	ASP3	0.819			
	Readiness to respond to users' questions	ASP4	0.786			
	Knowledge to answer users' questions	ASP5	0.602			
	Deal with users in a caring fashion	ASP6	0.854			
	Understand the needs of their users	ASP7	0.655			
	Willingness to help users	ASP8	0.744			
	Handling users' service problems	ASP9	0.772			
IC	Making electronic resources accessible	IC1	0.604	0.891	0.891	0.508
	Library web site to locate information on my own	IC2	0.699			
	The printed library materials I need for my work	IC3	0.734			
	The electronic information resources I need	IC4	0.795			
	Modern equipment that lets me easily access needed information	IC5	0.831			
	Easy-to-use access tools that allow me to find things on my own	IC6	0.716			
	Making information easily accessible for independent use	IC7	0.726			
	Print and/or electronic journal collections I require for my work	IC8	0.559			
LP	Library space that inspires study and learning	LP1	0.660	0.825	0.814	0.524
	Quiet space for individual activities	LP2	0.776			
	A comfortable and inviting location	LP3	0.760			
	The library is a gateway for study, learning or research	LP4	0.693			
	Community space for group learning and group	LP5	0.623			

Table 1 — Constructs reliability of measurement model

After achieving the construct reliability and validity, the means and standard deviations were calculated (Table 3) to achieve the study's first objective. Based on the mean scores of indicators, the top five most important variables were as follows:

- Quiet space for individual activities (LP2)
- A comfortable and inviting location (LP3)
- Library is a gateway for study, learning or research (LP4)
- Willingness to help users (ASP8)
- Library space that inspires study and learning (LP1)

It is interesting to observe that the students rated four of the five variables of the LP as important.

However, as shown in Fig. 2, the performance of this dimension is based on user expectations. LP emerged as a more robust dimension of the library, implying that library administrators successfully fulfilled the user expectations of this dimension.

IPA for Gender Difference

Regarding the second objective, the IPMA between the male and female engineering students is presented in Table 4. Overall, the results show that male and female students have similar importance and performance for the LibQUAL+® attributes. For example, the attributes of LP fell into Q2 (keep up with good work). Similarly, most ASP attributes are in Q3 (lower priority). However, the IC attributes were in Q1 (concentrate here) for male students. In contrast, females rated ASP attributes as the most important, suggesting that male and female students are rated differently.

Table 2 — Average variance extracted (AVE) matrix

	ASP	IC	LP
ASP	0.722		
IC	0.0519	0.713	
LP	0.0251	0.378	0.724

Note: Diagonal elements AVE for each factor. Off-diagonal are the squared correlations among factors.

Table 3 — Individual item details for the importance and performance mean scores

Item code	Importance		α	Performance		α
	Mean	SD		Mean	SD	
ASP1	5.36	1.40	0.85	4.68	1.50	0.91
ASP2	5.34	1.31		4.55	1.54	
ASP3	5.81	1.05		4.94	1.56	
ASP4	6.07	1.03		5.25	1.41	
ASP5	6.13	0.96		5.23	1.25	
ASP6	6.01	0.98		4.99	1.51	
ASP7	6.16	0.95		5.12	1.39	
ASP8	6.21	1.03		5.22	1.49	
ASP9	5.99	1.00		4.91	1.42	
IC1	6.11	1.12	0.91	4.85	1.56	0.79
IC2	6.16	1.01		4.96	1.61	
IC3	6.04	1.11		4.84	1.38	
IC4	6.03	1.12		4.89	1.39	
IC5	6.09	1.13		4.79	1.46	
IC6	6.07	1.11		4.92	1.45	
IC7	6.05	1.11		5.02	1.40	
IC8	5.98	1.18		5.24	3.87	
LP1	6.18	1.29	0.90	5.32	1.60	0.88
LP2	6.34	1.15		5.28	1.64	
LP3	6.25	1.13		5.38	1.52	
LP4	6.25	1.02		5.33	1.44	
LP5	6.15	1.19		5.63	1.47	

Table 4 — IPMA results based on Gender

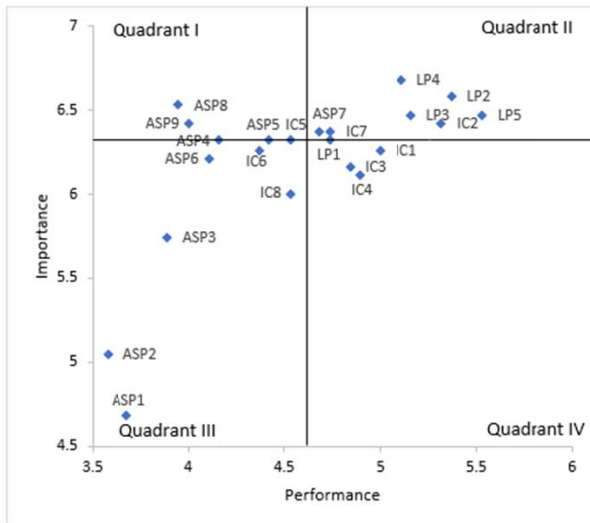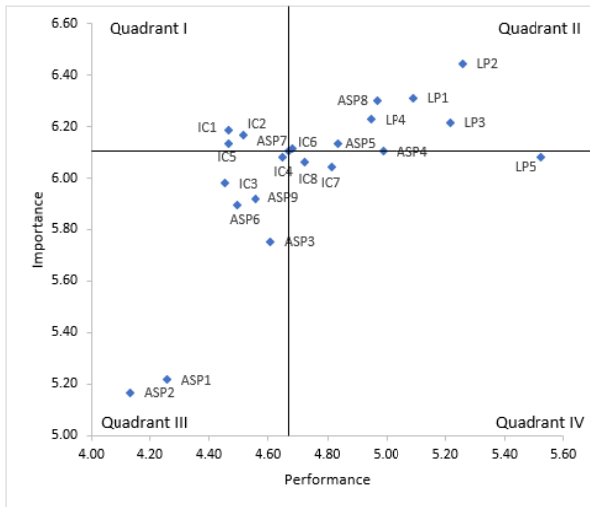| Quartile	Description	Male	Female
Q1	Concentrate here	IC1, IC2, IC5, ASP7	ASP8, ASP9, ASP5, ASP5, IC5
Q2	Keep up the good work	ASP5, ASP8, LP1, LP2, LP3, LP4, IC6	ASP7, IC 7, LP1, LP2, LP3, LP4, LP5, IC2
Q3	Low priority	IC3, IC4, ASP9, ASP6, ASP3, ASP2, ASP1	ASP1, ASP2, ASP3, ASP6, IC6, IC8
Q4	Possible to overkill	LP5, IC7, IC8, ASP4	IC1, IC3, IC4

Fig. 2 — IPA matrix comparison for a) males and b) females

Overall Importance-Performance Analysis

Finally, to achieve the third objective of the study, IPA is used to identify the variables that account for the strengths and weaknesses of library services.

Quadrant I 'Concentrate Here' (high Importance/ low Performance): This is a crucial area that needs improvement based on user ratings. This quadrant includes many variables such as making electronic resources accessible (IC1), a library website to locate information on my own (IC2), modern equipment that allows me to easily access the information I need (IC5), and easy-to-use access tools that allow me to find things on my own (IC6). Interestingly, all the items in this quadrant belong to the IC dimension, suggesting that the library needs to develop electronic
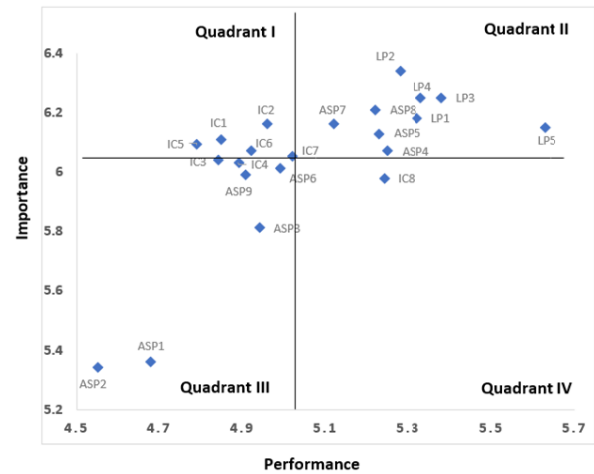

Fig. 3 — IPA for the global average, according to the median value for the axis.

resources to reduce the effort of users in obtaining relevant information, thereby improving the library service experience (Fig. 3).

Quadrant II 'Keep up the good work' (high Importance/high Performance). This quadrant implies that administrators can maintain the status quo, as the variables here are the library's strengths. Attributes associated with LP were rated high in perceived importance and present performance by users, suggesting that they found the library space inspiring, comfortable, and ideal for study, learning, and research. The other variables in this quadrant are from the first dimension, that is, AOS: Understand the needs of their users (ASP7), willingness to help users (ASP8), knowledge to answer user questions (ASP5), and readiness to respond to users' questions (ASP4). It can be concluded that the users were satisfied with the services provided by the library staff and their knowledge and ability to answer the queries.

Quadrant III: 'Low priority (low importance/low performance). The variables in this quadrant do not require much attention. The resources allocated to these areas can be diverted to areas in quadrant I. The low-priority variables, as rated by the users, instil confidence in users (ASP1), Giving users individual attention (ASP2), Consistently courteous (ASP3), deal with users in a caring fashion (ASP6), handling users' service problems (ASP9), the printed library materials I need (IC3), the electronic information resources I need (IC4) and Easy-to-use access tools that allow me to find things on my own (IC6).

Quadrant IV: 'Possible overkill' (low Importance/ high Performance). The variables in this quadrant are

overly highlighted by the library but rated as low importance by the users. The variable print and electronic journal collections I require for my work (IC8) fall into this quadrant. One plausible reason for this could be the sample characteristics of the study. The respondents were UG and PG engineering students, and they found that the library paid more attention than required to build a print and online journal collection. Library administrators should give them thoughts before making any changes to their journal collections. A similar survey may also be conducted among faculty members before considering any changes in the library's journal collection because it has been found that this variable was rated as important among faculty members in Texas A & M.

Meanwhile, there were a few concerns regarding the library's IC dimensions. Students were dissatisfied with the library websites and the electronic resources provided. Therefore, administrators should act appropriately to improve website and library service quality and procure more eBooks and other electronic resources based on students' requirements. This library website often serves as a workstation for library users and staff. Hence, effective presentation, content organization, and website access speed up librarians' work and save users' time. Proper listing of information enables users to locate physical and electronic sources within the library. Library administrators can use the website to keep their users well informed of the latest engineering and allied disciplines developments. Thus, the study recommends that libraries and network administration should improve the accessibility of library resources and websites. The proposed recommendations are inexpensive and straightforward to implement. They have potential benefits for both users and administrators in improving the service quality levels.

Conclusion

This study aims to demonstrate how IPMA can measure the strengths and weaknesses of the library service in a leading private engineering institute in Karnataka, India. Data were collected from the UG and PG students using the LibQUAL+® survey instrument and analysed using the IPM to identify areas for improvement. These findings are helpful for both librarians and policymakers in educational institutions. Study findings showed that the library administrators successfully provide conducive service to their students. Notably, LP emerged as the most crucial variable and a well-performed dimension of LibQUAL+®. The

students were satisfied with the library space and assistance provided by the library staff. For future research, it is recommended that library professionals integrate the importance-performance matrix and LibQUAL+® survey instrument to understand their users' perspectives better. This will also identify critical factors in structural modelling and simulations for policy development.

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