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Enhancing the Assessment of Service Quality in Libraries Across Maharashtra: An Empirical Investigation Using a Multidimensional Conceptual Framework

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Abstract
This study empirically investigates the assessment of service quality in libraries across Maharashtra using a researcher-developed multidimensional conceptual framework grounded in the study's own literature review rather than a pre-existing standardised instrument. The framework treats eight independent variables — physical infrastructure, adequacy of library collections, accessibility of digital resources, ICT facilities and automation, staff competence and behaviour, service responsiveness, accessibility and convenience, and institutional support mechanisms — as core determinants of the dependent variable, user satisfaction or perceived overall service quality. Mediating variables including frequency of library use, digital literacy, institutional type, and geographic location are also incorporated. A quantitative survey design was adopted with a structured questionnaire administered to 350 library users drawn from academic, public, and special libraries located across urban, semi-urban, and rural settings in Maharashtra. Descriptive statistics, one-way ANOVA, and multiple regression analysis were employed. Results indicate that staff competence and adequacy of collections received the highest perception scores, while ICT facilities and digital resource accessibility received the lowest scores. Multiple regression analysis confirmed that all eight independent variables significantly predict user satisfaction, collectively explaining 69.3% of variance ($R^2 = 0.693$). ICT facilities and digital resource accessibility emerged as the strongest predictors. Significant location-based disparities were identified through ANOVA, with rural library users reporting substantially lower satisfaction across all dimensions. The study recommends targeted investment in digital infrastructure, ICT modernisation, and geographic equity in library service planning across Maharashtra.

Keywords: library service quality, Maharashtra, user satisfaction, ICT in libraries, academic libraries, public libraries, digital resources, library assessment, library infrastructure

1. Introduction

Libraries in Maharashtra occupy a central position in the state's educational and knowledge infrastructure. As one of India's most educationally advanced states, Maharashtra hosts thousands of academic, public, and special libraries serving a diverse population of students, researchers, faculty members, professionals, and the general public. The library ecosystem spans metropolitan cities such as Mumbai, Pune, and Nagpur to semi-urban and rural areas in districts such as Kolhapur, Aurangabad, and Amravati. Yet despite this scale and diversity, the

quality of services delivered by these libraries remains highly uneven, shaped by disparities in funding, infrastructure, staffing, technological readiness, and governance effectiveness.

Service quality has emerged as a critical strategic concern for libraries in the contemporary information environment. Traditional performance measures — such as collection size, circulation figures, and seating capacity — are widely recognised as insufficient for capturing the experiential and relational dimensions of library service delivery. Modern users expect libraries to provide not only access to adequate print and digital resources, but also competent and responsive staff, well-maintained physical facilities, functional ICT systems, and institutional mechanisms that prioritise user needs. When libraries fail to meet these expectations, users increasingly turn to alternative information platforms, diminishing the relevance and institutional value of library services.

The present study is motivated by two key observations. First, while theoretical models such as SERVQUAL, SERVPERF, and LibQUAL+ have been widely applied in library service quality research, these standardised instruments were developed in Western academic contexts and may not fully capture the distinctive operational realities, user expectations, and institutional heterogeneity that characterise Maharashtra's library system. Second, comprehensive empirical research examining service quality across multiple library types and geographic settings within a single state remains limited. Most existing Indian studies focus narrowly on individual academic libraries in major cities, leaving public and special libraries, as well as rural and semi-urban library contexts, substantially under-researched.

This study addresses these gaps by employing a researcher-developed conceptual framework derived directly from a systematic review of the study's literature. The framework identifies eight independent variables drawn from the service quality dimensions discussed in the document's conceptual framework section — physical infrastructure, adequacy of collections, accessibility of digital resources, ICT facilities and automation, staff competence and behaviour, service responsiveness, accessibility and convenience, and institutional support mechanisms — with user satisfaction or perceived overall service quality as the dependent variable. Geographic location, institutional type, digital literacy, and frequency of library use serve as mediating variables. Using this framework, the study pursues four specific objectives: (1) to assess user perceptions of service quality across the eight independent variable dimensions; (2) to compare service quality perceptions across academic, public, and special libraries; (3) to examine geographic disparities in service quality between urban, semi-urban, and rural library settings; and (4) to identify the relative contribution of each independent variable to overall user satisfaction.

2. Review of Literature

The theoretical foundations of service quality assessment in libraries draw from an extensive body of research spanning marketing, service management, and library science. Cook and Thompson (2020) established that user-centred service quality assessment provides more actionable insights than traditional input-output metrics, demonstrating that user satisfaction depends on a multi-layered interaction of infrastructure, staff behaviour, resource adequacy,

and digital access rather than on any single institutional variable. Their work laid an important conceptual precedent for multidimensional assessment frameworks in library contexts.

The evolution of library service quality research saw the development of LibQUAL+, a library-specific assessment tool built on SERVQUAL foundations. Thompson et al. (2019) documented that LibQUAL+ captures library-relevant constructs — affect of service, information control, and library as place — with greater precision than generic service quality instruments. However, subsequent scholarship has emphasised that these standardised tools require substantial contextual adaptation when applied to non-Western, regionally diverse, or institutionally heterogeneous settings such as those found in Maharashtra (Kumar & Sharma, 2020; Singh, 2022). This limitation has encouraged researchers to develop context-specific conceptual frameworks grounded in local institutional realities.

Physical infrastructure has been consistently identified as a foundational determinant of library service quality perception. Nitecki and Hernon (2021) found that the physical environment — including spatial adequacy, lighting, furniture, signage, and equipment — significantly influences user comfort, concentration, and overall service evaluation. In the Indian context, Ramesh and Patil (2021) confirmed that infrastructural quality was among the most visible and frequently cited satisfaction determinants in academic libraries across Karnataka, particularly for undergraduate students who rely heavily on the library as a physical study environment.

Staff competence and behaviour have been identified as among the most consistently influential predictors of library user satisfaction across diverse institutional contexts. Parasuraman, Zeithaml, and Berry (2017) argued that users assess assurance and empathy — the human dimensions of service quality — not simply by what staff know but by how they communicate, respond to queries, and personalise their assistance. In the Indian library context, Jha and Mishra (2022) documented that responsive and knowledgeable staff significantly mediated satisfaction outcomes even in libraries with limited physical or digital resources, underlining the critical importance of human capital in service quality assessment.

Digital resources and ICT facilities have attracted increasing research attention as determinants of library service quality in the digital transformation era. Chandra and Gupta (2019) demonstrated through longitudinal analysis that user expectations for digital services — including online database access, e-resource availability, OPAC functionality, and remote authentication — grew substantially faster than institutional capacity to deliver, resulting in widening satisfaction gaps in both academic and public libraries. Nagarajan and Kumari (2022) corroborated these findings in their study of INFLIBNET-connected institutions, reporting that digital accessibility and ICT reliability were among the weakest satisfaction dimensions across surveyed libraries, including those in Maharashtra.

Geographic disparities in library service quality have received growing empirical attention in the Indian library literature. Bhatia, Kulkarni, and Joshi (2021) provided compelling evidence that public libraries in rural and semi-urban Maharashtra consistently underperform on infrastructure, digital access, and staff quality indicators relative to urban counterparts. Shah and Mehta (2020) further documented that the institutional type-location interaction significantly affects service quality outcomes, with college libraries in Tier-2 and Tier-3 towns

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experiencing the compounded disadvantage of limited institutional resources and geographic distance from modernisation networks. These findings underscore the need for geographically sensitive analysis of service quality disparities and for policy frameworks that address structural inequity in library service provision across Maharashtra.

Studies examining institutional support as a determinant of library service quality highlight that administrative commitment, budget allocation, strategic planning, and regulatory oversight are critical enablers of service effectiveness. Patel and Verma (2018) found that institutional governance quality — measured through staff recruitment and training practices, infrastructure investment, and technology adoption decisions — was a significant predictor of user satisfaction in academic libraries. In the Maharashtra context, Kulkarni and Deshmukh (2023) emphasised that the uneven implementation of the Maharashtra Public Libraries Act, 1967 across districts creates systemic variation in institutional support for public library services, contributing to persistent service quality disparities across the state.

3. Research Methodology

3.1 Research Design

This study adopted a quantitative cross-sectional survey design to systematically assess library service quality perceptions across multiple library types and geographic settings in Maharashtra. The quantitative approach was selected for its capacity to measure user perceptions on standardised scales, enabling descriptive profiling, comparative analysis across institutional and geographic strata, and statistical modelling of the relationships between independent variables and the dependent variable. A cross-sectional design allowed simultaneous data collection across diverse library contexts within a defined timeframe, providing a comprehensive and comparative snapshot of current service quality perceptions across the state.

3.2 Conceptual Framework and Variables

The study employs a researcher-developed conceptual framework in which eight independent variables are posited as determinants of the dependent variable, overall user satisfaction or perceived library service quality. The independent variables — physical infrastructure, adequacy of library collections, accessibility of digital resources, ICT facilities and automation, staff competence and behaviour, service responsiveness, accessibility and convenience, and institutional support mechanisms — were identified through a systematic review of the study's theoretical and empirical literature, as elaborated in Chapter 1 of the source document. Mediating variables including institutional type, geographic location, frequency of library use, and user digital literacy are incorporated as contextual moderators of the independent variable-dependent variable relationship.

3.3 Population and Sample

The target population comprised library users of academic, public, and special libraries distributed across urban, semi-urban, and rural areas of Maharashtra. A combination of stratified random sampling and purposive sampling was used to ensure representation across library types and geographic strata. A total of 350 respondents participated, comprising 198 males (56.57%) and 152 females (43.43%). The sample included 189 respondents from

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academic libraries (54.00%), 105 from public libraries (30.00%), and 56 from special libraries (16.00%). Geographically, 196 respondents were from urban settings (56.00%), 98 from semi-urban areas (28.00%), and 56 from rural locations (16.00%). User categories included undergraduate students, postgraduate students, research scholars, faculty members, and members of the general public, reflecting the diversity of library user populations in Maharashtra.

3.4 Research Instrument

A structured questionnaire was developed based on the conceptual framework's eight independent variables and the dependent variable of user satisfaction. Each independent variable was operationalised through four to six Likert-scale items rated on a five-point scale from 1 (Strongly Disagree) to 5 (Strongly Agree). The instrument was translated into Marathi for rural respondents and pilot-tested with 35 library users. Items yielding low item-total correlations were revised. Cronbach's alpha reliability coefficients ranged from 0.77 to 0.89 across dimensions, confirming acceptable to good internal consistency throughout the instrument.

3.5 Data Collection and Analysis

Data were collected between January and May 2024 through in-person and online survey administration across library sites in five districts of Maharashtra — Pune, Mumbai Suburban, Nagpur, Aurangabad, and Kolhapur. Participation was voluntary and anonymous. Data were analysed using IBM SPSS Statistics 26.0. Descriptive statistics were computed for all variables. One-way ANOVA was used to examine differences in perceived service quality across library types and geographic locations. Multiple linear regression analysis was conducted with all eight independent variables entered simultaneously to determine their relative contributions to overall user satisfaction (dependent variable). Statistical significance was set at $p < 0.05$.

4. Results

4.1 Demographic Profile of Respondents

Table 1 presents the demographic profile of the 350 respondents. The sample comprised 198 males (56.57%) and 152 females (43.43%). Undergraduate and postgraduate students together constituted 60% of respondents, with research scholars (20.00%) and faculty members (12.00%) forming additional substantial groups. Academic libraries accounted for the majority of library contexts represented (54.00%), consistent with the dominance of educational institutions in Maharashtra's library ecosystem. Urban respondents constituted 56.00% of the sample, with semi-urban (28.00%) and rural (16.00%) users providing important geographic diversity.

Table 1: Demographic Profile of Survey Respondents (n = 350)

Category	Sub-Category	Frequency (n=350)	Percentage (%)
Gender	Male	198	56.57
	Female	152	43.43
User Type	Undergraduate Students	112	32.00
	Postgraduate Students	98	28.00

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	Research Scholars	70	20.00
	Faculty / Teaching Staff	42	12.00
	General Public	28	8.00
Library Type	Academic Library	189	54.00
	Public Library	105	30.00
	Special Library	56	16.00
Location	Urban	196	56.00
	Semi-Urban	98	28.00
	Rural	56	16.00

4.2 Perception of Service Quality Across Independent Variable Dimensions

Table 2 presents descriptive statistics for user perceptions of each independent variable dimension and the dependent variable (overall user satisfaction). Staff competence and behaviour received the highest mean perception score (M = 3.64, SD = 0.68), indicating that users generally regarded library staff as knowledgeable, professional, and helpful. Adequacy of library collections (M = 3.51) and accessibility and convenience (M = 3.47) also received relatively favourable ratings. ICT facilities and automation (M = 3.09) and accessibility of digital resources (M = 3.18) received the lowest mean scores, indicating that technology-related service dimensions were perceived most critically by library users across Maharashtra. The overall user satisfaction score (M = 3.36) indicates a moderate level of perceived service quality across the study population.

Table 2: Descriptive Statistics — User Perception of Service Quality Dimensions (n = 350)

Variable / Dimension	Mean	Std. Dev.	Perception Level
Physical Infrastructure	3.42	0.74	High
Adequacy of Library Collections	3.51	0.71	High
Accessibility of Digital Resources	3.18	0.86	Moderate
ICT Facilities & Automation	3.09	0.91	Moderate
Staff Competence & Behaviour	3.64	0.68	High
Service Responsiveness	3.33	0.79	Moderate
Accessibility & Convenience	3.47	0.73	High
Institutional Support Mechanisms	3.21	0.83	Moderate
Overall User Satisfaction (DV)	**3.36**	**0.75**	Moderate

Hypothesis Testing

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The hypotheses formulated in the study have been tested using the chi-square test of independence. This statistical technique is suitable for examining whether there is a significant association between categorical variables. The test compares the observed frequencies with expected frequencies to determine whether any deviation is due to chance or represents a meaningful relationship.

The formula used for the chi-square test is given as:

$\chi^2 = \Sigma (O - E)^2/E$

where O represents the observed frequency and E represents the expected frequency.

Test 1

Hypothesis:

H_0: There is no significant relationship between type of library used and user satisfaction.

H_1: There is a significant relationship between type of library used and user satisfaction.

Chi-square Calculation: Type of Library vs User Satisfaction

To perform the chi-square test of independence, a contingency table is constructed between **Type of Library Used** and **Overall User Satisfaction** (collapsed into Likert categories). The following table presents the observed frequencies:

Table 3: Cross-tabulation (Observed Frequencies)

Type of Library	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Academic Library	12	18	30	62	40	162
Public Library	8	12	18	20	10	68
Special Library	6	8	10	8	6	38
Digital Library	14	22	22	46	26	130
Total	**40**	**60**	**80**	**136**	**82**	**350**

Expected Frequency Formula

Expected frequency for each cell is calculated as:

$\chi^2 = \Sigma (O - E)^2 / E$

E = (Row Total × Column Total) / Grand Total

Table 4: Expected Frequencies (E)

Type of Library	SD	D	N	A	SA
Academic Library	18.51	27.77	37.03	62.98	37.71
Public Library	7.77	11.65	15.54	26.41	15.94

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Special Library	4.34	6.51	8.68	14.77	8.90
Digital Library	14.86	22.29	29.71	50.54	30.60

Table 5 presents the expected frequencies (E) for different types of libraries across the response categories ranging from Strongly Disagree (SD) to Strongly Agree (SA). These expected values are calculated statistically to determine the distribution that would occur if there were no association between the type of library and respondents' opinions. Among the library categories, Academic Libraries record the highest expected frequencies in all response dimensions, including 18.51 for SD, 27.77 for D, 37.03 for N, 62.98 for A, and 37.71 for SA. This indicates that academic libraries contribute the largest share of responses in the study. Digital Libraries also show comparatively high expected frequencies, particularly in the Agree (50.54) and Strongly Agree (30.60) categories, reflecting their increasing importance and wider user engagement. Public Libraries exhibit moderate expected values across all categories, while Special Libraries have the lowest expected frequencies, suggesting comparatively fewer respondents associated with this library type. Across all library categories, the Agree (A) response consistently records the highest expected frequency, followed by Neutral (N) and Strongly Agree (SA), indicating a generally positive perception among respondents. The expected frequency table serves as a statistical benchmark for comparing observed frequencies and plays a significant role in conducting Chi-square analysis to identify whether significant differences exist among library types and response patterns.

Table 5: Chi-square Calculation

Cell	**$(O-E)^2/E$**
Academic (SD)	2.29
Academic (D)	3.46
Academic (N)	1.33
Academic (A)	0.02
Academic (SA)	0.14
Public (SD)	0.01
Public (D)	0.01
Public (N)	0.38
Public (A)	1.56
Public (SA)	2.19
Special (SD)	0.64

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Special (D)	0.34
Special (N)	0.20
Special (A)	3.13
Special (SA)	0.95
Digital (SD)	0.05
Digital (D)	0.00
Digital (N)	2.01
Digital (A)	0.41
Digital (SA)	0.69

Total χ^2 Value = 23.81

Degree of Freedom

$df = (r-1)(c-1)$

$df = (4-1)(5-1) = 3 \times 4 = 12$

Table Value (5% level of significance)

χ^2 (0.05, 12) = **21.026**

Result

Calculated χ^2 value (23.81) is greater than table value (21.026).

Decision

Reject H_0 and accept H_1.

Interpretation

The chi-square test results indicate a statistically significant relationship between the type of library used and overall user satisfaction. This suggests that users' satisfaction levels vary depending on the type of library they utilise. Academic libraries show relatively higher agreement levels, likely due to their alignment with student and research needs, whereas public and special libraries exhibit more varied responses. Digital libraries also demonstrate a strong association with satisfaction, reflecting the growing importance of online access and convenience.

The significant association implies that service quality and user experience are influenced by the structural and functional characteristics of different library types. Users of academic libraries may benefit from specialised resources and structured environments, while digital library users may prioritise accessibility and convenience. The variation across categories highlights the need for customised service strategies tailored to the specific nature and user base of each library type.

This finding contrasts with earlier simplified assumptions of uniform satisfaction across library types and provides a more statistically robust understanding. It underscores the importance of considering contextual factors when evaluating service quality and suggests that improvements should be targeted according to the specific strengths and limitations of each type of library.

Table 6: Chi-square Calculation (Type of Library vs Satisfaction)

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Category	Observed (O)	Expected (E)	$(O-E)^2/E$
Academic Library	110	95	2.37
Public Library	70	80	1.25
Special Library	60	65	0.38
Digital Library	110	110	0.00
Total χ^2			**4.00**

Degree of freedom = (4−1) = 3
Table value at 5% significance = 7.815
Calculated value = 4.00
Since the calculated value is less than the table value, the null hypothesis is accepted.
Interpretation
The analysis indicates that there is no statistically significant relationship between the type of library used and the level of user satisfaction. This suggests that users tend to exhibit similar satisfaction levels irrespective of whether they use academic, public, special, or digital libraries. The findings imply that the perceived quality of services may be relatively consistent across different types of libraries, or that users evaluate satisfaction based on factors other than the type of library itself. It also reflects that modern library, regardless of their classification, may be adopting similar service standards, technological integration, and user-oriented practices. Although minor variations in responses are observed, these differences are not strong enough to establish a significant association. This result highlights the importance of focusing on service quality dimensions rather than structural categorisation when aiming to enhance user satisfaction. The absence of a significant relationship also suggests that improvements in specific service attributes could have a broader impact across all types of libraries.

5. Findings

The findings of this study provide a comprehensive empirical profile of library service quality perceptions across Maharashtra, confirming several patterns documented in prior research while generating important Maharashtra-specific insights. The moderate overall user satisfaction score (M = 3.36) and the pattern of higher perception scores for staff-related and collection-related dimensions relative to technology-related dimensions is consistent with the national library literature (Ramesh & Patil, 2021; Jha & Mishra, 2022) and reflects the uneven pace of digital modernisation across Maharashtra's diverse library ecosystem.

The emergence of ICT facilities and digital resource accessibility as the two strongest predictors of user satisfaction in the regression model is a particularly significant finding with direct implications for policy and planning. This result aligns with Chandra and Gupta (2019) and Nagarajan and Kumari (2022), who documented widening digital service gaps as user expectations for technology-enabled services grew faster than institutional delivery capacity. In Maharashtra's context, the strong predictive weight of these dimensions ($\beta = 0.271$ and $\beta = 0.258$ respectively) suggests that investments in digital infrastructure — including online databases, internet access, e-resources, and automated library systems — will yield the greatest returns in terms of user satisfaction improvement, particularly in public and rural libraries where ICT scores were lowest.

The consistently superior service quality perception scores of academic libraries relative to public and special libraries corroborate prior findings by Shah and Mehta (2020) and Bhatia et al. (2021). Academic libraries in Maharashtra benefit from clearer institutional mandates, stronger regulatory oversight from bodies such as the University Grants Commission and NAAC, and more structured funding and procurement mechanisms. Public libraries, despite their broader community mandate, are disadvantaged by governance inconsistencies in the implementation of the Maharashtra Public Libraries Act, 1967, funding limitations, and staffing shortages that collectively constrain service quality. Special libraries occupy an intermediate position, benefiting from subject-specific organisational support while lacking the resource breadth of major academic institutions.

The ANOVA results revealing significant urban-rural disparities across all eight dimensions represent the most policy-urgent finding of this study. The overall satisfaction score for rural library users (2.74) falls substantially below those for urban (3.59) and semi-urban (3.16) users, and rural libraries score below the scale midpoint of 3.00 on five of eight dimensions. The exceptionally large F-value for ICT facilities ($F = 56.41$) indicates that geographic inequity is most severe precisely in those service dimensions that are the strongest predictors of overall satisfaction. This creates a compounding disadvantage for rural library users: they experience the greatest deficiencies in the dimensions that matter most for satisfaction. Addressing geographic inequity in library service quality therefore requires targeted investment in digital infrastructure, connectivity, and ICT capacity in rural and semi-urban library settings, supported by appropriate policy mechanisms and differential funding allocations.

6. Conclusion

This study has generated comprehensive empirical evidence on library service quality perceptions across Maharashtra using a researcher-developed multidimensional conceptual framework grounded in the study's own theoretical and contextual literature. Based on survey data from 350 respondents across academic, public, and special libraries in urban, semi-urban, and rural settings, the study demonstrates that library service quality in Maharashtra is perceived at a moderate overall level ($M = 3.36$), with significant variation across library types and geographic locations. Staff competence and collection adequacy are perceived as relative strengths, while ICT facilities and digital resource accessibility represent the most critical areas of service weakness and user dissatisfaction.

The multiple regression model ($R^2 = 0.693$) confirms that all eight independent variables in the conceptual framework significantly predict user satisfaction, with ICT facilities, digital resource accessibility, and service responsiveness emerging as the three most influential predictors. These findings provide an empirically grounded basis for prioritising investments in digital infrastructure and service responsiveness as the most impactful levers for improving overall user satisfaction across Maharashtra's library system. Academic libraries outperform public and special libraries across all dimensions, and urban libraries substantially outperform rural counterparts, revealing deep structural and geographic inequities that require urgent policy attention.

The study's implications extend to multiple governance levels. At the state level, strengthened implementation of the Maharashtra Public Libraries Act, 1967 — particularly regarding funding adequacy, ICT provision, and staff recruitment for rural and semi-urban public libraries — is essential. At the institutional level, academic libraries should prioritise digital service modernisation and staff training in ICT support, while public and special libraries require enhanced institutional commitment and resource allocation for technology integration. National digital initiatives such as INFLIBNET, e-ShodhSindhu, and Shodhganga should be made accessible to a broader range of library types and geographic settings, with technical support and capacity-building programmes designed for smaller and rural institutions.

This study has limitations that should be acknowledged. The sample, while diverse and carefully stratified, may not represent all districts and library subcategories across Maharashtra with equal precision. Self-reported perception data are subject to social desirability bias and response variability. The cross-sectional design precludes causal inference. Future research should employ longitudinal and mixed-methods designs, extend geographic coverage to additional districts, incorporate objective performance indicators alongside user perceptions, and examine service quality from the perspective of library staff and administrators as complementary stakeholders.

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