GSR

GLOBAL SOCIOLOGICAL REVIEW

HEC-RECOGNIZED CATEGORY-Y

VOL. X ISSUE II, SPRING (JUNE-2025)

Double-blind Peer-review Research Journal
www.gsrjournal.com
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Article title

Evaluating Web-Based Library Services: A Comparative Study of Private and Public University Libraries in Karachi, Sindh

Abstract

The shift to digital platforms has transformed academic library services, making web-based access essential in higher education. This study compares web-based library services of six Karachi universities three private and three public using a qualitative content analysis grounded in the LibQUAL+ Model. Findings show private universities offer more interactive features, while public ones provide clearer service descriptions. Common gaps include a lack of institutional repositories, limited open-access resources, weak multilingual support, and poor user engagement. To enhance digital services, libraries should integrate live chat, strengthen citation tools, and improve remote access to boost usability, accessibility, and academic support.

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02	Evaluating Web-Based Library Services: A Comparative Study of Private and Public University Libraries in Karachi, Sindh		
Authors	Nadia Kiran Muhammad Kamil Lakho Subhash Guriro	**DOI**	10.31703/gsr.2025(X-II).02
		Pages	10-22
		Year	2025
		Volume	X
		Issue	II

Referencing & Citing Styles	
APA	Kiran, N., Lakho, M. K., & Guriro, S. (2025). Evaluating Web-Based Library Services: A Comparative Study of Private and Public University Libraries in Karachi, Sindh. *Global Sociological Review*, *X*(II), 10-22. https://doi.org/10.31703/gsssr.2025(X-II).02
CHICAGO	Kiran, Nadia, Muhammad Kamil Lakho, and Subhash Guriro. 2025. "Evaluating Web-Based Library Services: A Comparative Study of Private and Public University Libraries in Karachi, Sindh." *Global Sociological Review* X (II):10-22. doi: 10.31703/gsssr.2025(X-II).02.
HARVARD	KIRAN, N., LAKHO, M. K. & GURIRO, S. 2025. Evaluating Web-Based Library Services: A Comparative Study of Private and Public University Libraries in Karachi, Sindh. *Global Sociological Review,* X**,** 10-22.
MHRA	Kiran, Nadia, Muhammad Kamil Lakho, and Subhash Guriro. 2025. 'Evaluating Web-Based Library Services: A Comparative Study of Private and Public University Libraries in Karachi, Sindh', *Global Sociological Review*, X: 10-22.
MLA	Kiran, Nadia, Muhammad Kamil Lakho, and Subhash Guriro. "Evaluating Web-Based Library Services: A Comparative Study of Private and Public University Libraries in Karachi, Sindh." *Global Sociological Review* X.II (2025): 10-22. Print.
OXFORD	Kiran, Nadia, Lakho, Muhammad Kamil, and Guriro, Subhash (2025), 'Evaluating Web-Based Library Services: A Comparative Study of Private and Public University Libraries in Karachi, Sindh', *Global Sociological Review,* X (II), 10-22.
TURABIAN	Kiran, Nadia, Muhammad Kamil Lakho, and Subhash Guriro. "Evaluating Web-Based Library Services: A Comparative Study of Private and Public University Libraries in Karachi, Sindh." *Global Sociological Review* X, no. II (2025): 10-22. https://dx.doi.org/10.31703/gsssr.2025(X-II).02.

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Evaluating Web-Based Library Services: A Comparative Study of Private and Public University Libraries in Karachi, Sindh

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Contents

Abstract

The shift to digital platforms has transformed academic library services, making web-based access essential in higher education. This study compares web-based library services of six Karachi universities three private and three public using a qualitative content analysis grounded in the LibQUAL+ Model. Findings show private universities offer more interactive features, while public ones provide clearer service descriptions. Common gaps include a lack of institutional repositories, limited open-access resources, weak multilingual support, and poor user engagement. To enhance digital services, libraries should integrate live chat, strengthen citation tools, and improve remote access to boost usability, accessibility, and academic support.

Introduction

In the age of digital transformation, the services of academic libraries have drastically changed. The concept of the library is transitioning from traditional physical collections to digital collections that meet the changing demands of library patrons (Borgman, 2000). The digital revolution has transformed the way people interact with libraries, the websites of university libraries are now vital resources for providing digital services including online research

help, digital archives, remote access to e-books and journals, and virtual user support (Bakti et al., 2020).

Universally libraries have adopted digital services, which ensure that information is always accessible beyond the boundaries. According to a survey conducted by Tenopir et al. (2015) over 85% of faculty and students prefer online library services over traditional visits, emphasizing the rising preference for digital platforms. The usefulness, accessibility, and quality of services still vary. A well-structured library website increases the use of the library and improves user experience and information retrieval. Many academic library websites still struggle with issues including outdated content, restricted information, and lack of interactive support and technical skills (Chua & Goh, 2010). Given higher education's growing dependence on digital platforms, web-based library services are essential for supporting academic activities (Tenopir et al., 2012). For libraries to stay relevant in the digital era, they need to adapt to constantly changing new technology to serve the changing patron needs (Chua & Goh, 2010). Academic performance, student participation, and research productivity are all improved at universities with strong digital library services (Xu & Du, 2018). Also, the use of cloud computing and artificial intelligence has enhanced the effectiveness and accessibility of library services (Albarillo, 2018). However, many academic institutions continue to struggle with their web-based library platforms (Zhou, 2018). Libraries must regularly embrace new technology to meet the changing demands of patrons and to stay relevant in the digital era.

University libraries in developed countries provide open-access repositories, customized user portals, and highly interactive websites with chatbots supported by artificial intelligence. On the other hand, due to funding limitations, unstable proficiency levels of patrons towards technology, and inadequate infrastructure, libraries in underprivileged countries often struggle to implement and maintain digital services(Rafique et al., 2023). Public sector universities in Pakistan find it difficult to keep up with the rapid advancements in technology (Salman, 2023). Sindh

has a mixed digital library condition because it is home to many public and private universities However, many university libraries in Sindh continue to use static websites with little interaction, lacking necessary elements like virtual reference services, multimedia resources, and integrated search(Deivam, 2021).

Problem Statement

In the digital age, university libraries play a crucial role in providing web-based services to support students, researchers, and faculty. However, the effectiveness of these services varies among institutions, affecting access to academic resources. While previous studies (Abubakar, 2024; Mairaj, 2013; Mumtaz et al., 2021) have examined web-based library services in Pakistan and other regions, they highlight inconsistencies in usability, content quality, and accessibility. There is limited comparative analysis between public and private university library websites in Pakistan. This study addresses this gap by evaluating the web-based library services of three public and three private universities in Karachi.

Justification

Due to the growing dependence on digital platforms for information access, a critical assessment of web-based library services is crucial. Although the usability, navigation, and digital resources of library websites have been evaluated in previous studies (Chakraborty, 2021; Iqbal et al., 2022; Rafiq & Ganaee, Muhammad, 2016), more specialized research that focuses on Karachi academic institutions is required. This study is important because it provides a thorough understanding of best practices by comparing web-based services in a public and private university. It will be easier to find areas for development and make sure that library websites successfully satisfy user's needs.

Objectives of the study

The study focuses on evaluating web-based library services of six universities in Karachi. The research examines library website content using a LibQUAL+

based framework. There are the following objectives of the study:

- To evaluate the web-based library services of public and private universities in Karachi, focusing on user experience, content accessibility, and website functionality.
- To identify differences, similarities, and gaps in web-based library services of public and private universities.

There is limited evidence of comparative analysis between public and private university library websites in Pakistan. This study addresses this gap by evaluating the web-based library services of three public and three private universities in Karachi.

Literature Review

To compare the web-based services of the top 50 university libraries globally for assessing features like virtual reference desks, online interlibrary loans, and social networking integration research was carried out (Datta, 2015). Another study examined the content and structure of engineering college library websites in Goa. It ranks them based on usability and comprehensiveness, offering recommendations for enhancing online services (Hugar, 2019)For the evaluation of website content, organization, and digital services a study of four university libraries in Assam India, was conducted, the research highlights the need for structured content, enhanced accessibility, and integration of Web 2.0 tools (Arandhara, 2021).

To assess the content of top-ranking Indian university library websites based on 58 criteria research was conducted. Findings revealed that while most provided e-resources and databases but many did not provide information on library services and infrastructure (Chakraborty, 2021). Das & Gurey (2021) analyzed the content and usability of 26 state university websites in West Bengal. Findings showed gaps in user-friendliness and quality of digital library resources. Mandrekar (2021) analyzed the web-based services provided by college libraries in Goa, India, during the COVID-19 pandemic. The study found that library websites lacked well-organized content and structure to meet user needs. Roy & Mandal

(2021) analyzed selected IISER library websites in India, identifying gaps in digital resources, accessibility features, and interactive services. The availability of research support was explored and quantitatively analyzed on the academic library website in India and it found that there was good visibility of research support on central university library websites in providing research support to researchers on library websites (Sharma & Choudhary, 2022). A large-scale research was conducted to evaluate 1,698 public library websites in Australia, Canada, and the United States, assessing their online resources and staff availability to address user inquiries, using descriptive statistics to report the findings over a three-year period. (Velasquez & Campbell-Meier, 2022). Kushwaha (2023) investigated web-based library services in four private universities in Delhi NCR, focusing on digital access, library collections, and web usability. Findings indicate inconsistencies in services across universities. Another study evaluated the web presence of university libraries in Nepal, highlighting the lack of uniformity in information management and underutilization of IT facilities, emphasizing the need for improved online services to meet users' information needs effectively(Manandhar,2023). Abubakar (2024) compared academic library websites using Web Content Management Systems, focusing on design, content, interactivity, accessibility, usability, and performance. It highlights the strengths and weaknesses of libraries at four African universities, offering recommendations for improvement in user experience.

Qutab & Mahmood (2009) examined Pakistani library websites and found that they were inconsistent, and had poor material selection and navigation. A survey was conducted to evaluate the use of Pakistani university library websites 17 university webpages were assessed. Findings indicate that library websites are mainly used for online catalogs for searching for course-related materials (Mairaj, 2013). Similarly, one more survey of 85 university library websites in Pakistan was conducted, identifying strengths in navigation and OPAC availability but weaknesses in Web 2.0 integration and general library information. Explored the

existence and quality of library websites in Pakistani universities, finding that public universities have a better digital presence than private ones. It highlights the lack of Web 2.0 tools and digital subscriptions (Ganaee & Rafiq, 2016). Research was also conducted on the library websites from Punjab and Sindh, finding disparities between public and private universities in terms of content, accessibility, and digital services(Rafiq & Ganaee, Muhammad, 2016). Mumtaz et al. (2021) evaluated the web-based content of 177 university libraries in Pakistan. It finds that only 42% of universities have library websites, and most lack essential content, navigation tools, and Web 2.0 features.

LibQUAL+ and Service Quality Studies in Libraries

A study based on LibQUAL+ compared the expectations of patrons in health science libraries with those in general research libraries. The study's conclusion that service expectations were consistent across library types despite the requirement for medical information further reinforced the model's adaptability in a range of circumstances (Thompson et al., 2007). The same model is used to identify the inadequacies in digital and physical library services, suggesting that it may be adapted to evaluating web-based services as well (Brito & Vergueiro, 2013). Pourahmad et al. (2016) evaluated library services in North Khorasan, Iran, using LibQUAL+, and discovered notable discrepancies between the services that patrons wanted and those that were provided. Maharshi Dayanand University's (MDU) central library's performance was measured by using the LibQUAL+ framework. Although the Library as Place (LP) dimension received the highest score, their research showed that total service quality was below user expectations, pointing to areas that needed improvement (Kumar & Mahajan, 2019). Oak & Patil (2021)used LibQUAL+ to measure the difference between perceived and expected service quality in a comparative analysis of academic libraries in India. Indonesian college libraries' use of the LibQUAL+ assessment paradigm, including Muslim-friendly

librarian services as a new component. Their results showed that public and Islamic-based universities had different degrees of service satisfaction, indicating that institutional and cultural circumstances affect consumer expectations (Rizky et al., 2021).

Research Methodology

The qualitative content analysis approach is adopted to systematically examine web-based library services. The LibQUAL+ framework serves as the foundation of the study, a checklist was designed based on the LibQUAL+ model, containing three dimensions and 22 items. Since the study focuses on web-based services, data collection is limited to the content available on the selected universities' official websites. Each university evaluated 22 criteria from the adapted LibQUAL+ framework. To maintain systematic citation management, Zotero was utilized for collecting, storing, and formatting references. Universities were selected using criterion sampling based on four main criteria: existence on the web, being multidisciplinary, a minimum of ten years in operation, and location in Karachi. The list of HEC-recognized universities was accessed through the Higher Education Commission (HEC) Sindh website. Based on these criteria, the following three public and three private universities in Karachi were selected.

Public Sector Universities

1. University of KarachiThe University of Karachi, one of Pakistan's largest and most prestigious public universities, was founded in 1951. Students and researchers can access the university's library website at https://www.uok.edu.pk/library/.
2. Benazir Bhutto Shaheed University LyariBenazir Bhutto Shaheed University Lyari (BBSUL) founded in 2010, is an interdisciplinary university. The library's website can be accessed at https://www.bbsul.edu.pk/Library.
3. Sindh Madressatul Islam UniversitySindh Madressatul Islam University (SMIU), which was founded in 2012, is a historically significant

institution that has evolved into a contemporary university with faculties of social science, computer science, Environmental sciences, accounting, banking and finance, and business administration. The university provides teachers and students with a range of academic materials through its library, which can be accessed at https://www.smiu.edu.pk/Library.

Private Sector Universities

1. Hamdard University Hamdard University, founded in 1992, is one of the oldest private universities in Karachi. Its library is accessible at https://www.hamdard.edu.pk/library–isb/.
2. Iqra University, Karachi Iqra University is a prestigious private university that was founded in 2000. For scholars and students, the library's website is accessed at https://iqra.edu.pk/irc/.
3. Habib University Habib University is a multidisciplinary university, established in 2012. The university library website can be accessed via https://habib.edu.pk/library/.

Data Analysis

Data analysis follows a qualitative content analysis approach. Each website is assessed using the adapted LibQUAL+ checklist, and findings are categorized under the three modified dimensions. The data is interpreted using a descriptive method. To identify differences, similarities, and weaknesses in web-based library services, a comparative study was conducted, followed by a descriptive interpretation of the results.

Ethical Consideration

As this study exclusively evaluated publicly accessible web content, it did not involve human participants or require ethical approval for surveys or interviews. However, ethical research practices are followed, and all the data is used only for academic purposes.

Adaption of LibQUAL+ Framework

The LibQUAL+ framework was designed in 2000 by the Association of Research Libraries (ARL), the foundation of this framework was based on the Service Quality Theory (SERVQUAL), which evaluates the service quality of industries (ARL, 2022). The purpose of the LibQUAL+ framework is to assess the quality of library services, specifically in a digital environment. The framework is based on three dimensions as shown in

Figure 1
LibQUAL+ Framework
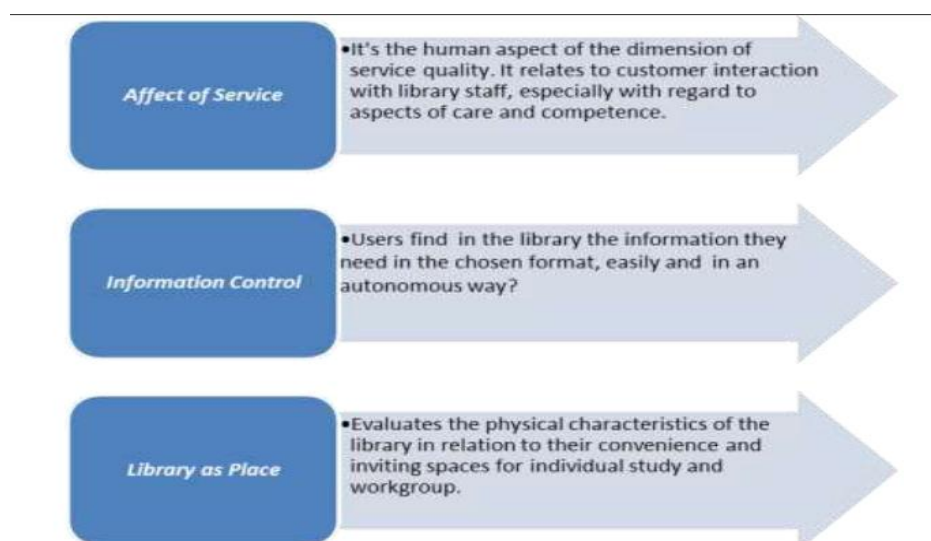
Source: LibQUAL+ Dimentions (Brito & Vergueiro, 2013)

Although LibQUAL+ has long been used to evaluate physical library services, its use in website evaluations is still limited, especially in Pakistan there is no study found using the LibQual+ framework. However, research shows that the model may successfully detect service gaps and customer expectations, as shown by Pourahmad et al. (2016) and Kumar and Mahajan (2019). This study offers an organized framework for evaluating online-based library services by combining web content analysis and adapting LibQUAL+-based evaluation criteria. The dimensions and 22 items list were taken from Kumar & Mahajan (2019).

For this study, the LibQUAL+ framework has been used for data collection because it has standardized dimensions that have been modified to evaluate web-based library services as seen in Figure 2.

Figure 2

Libqual+ Dimensions
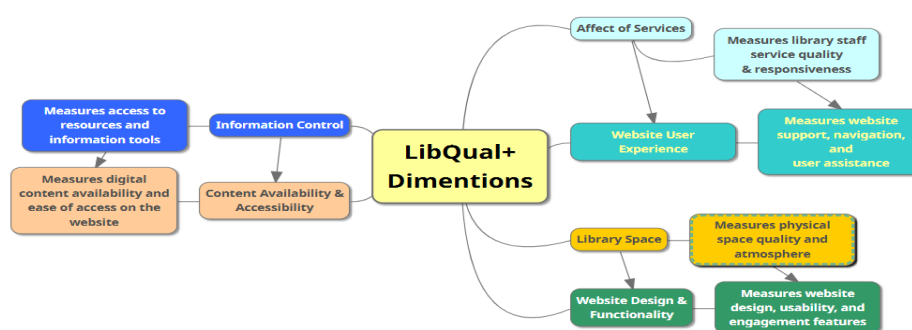
Source: Researcher's self-made diagram using online platform https://www.mindmup.com/ based on Libqual+ dimensions

Findings

Websites of all six university libraries were examined for web-based library services, findings are presented below in table format, following the descriptive interpretation method, where necessary, the frequency of services along with the percentage of availability were given, for that reason a scoring system was adopted, where Service Available = 1 point, Limited or Incomplete Service = 0.5 points, and Service Not Available = 0 points, with a total possible score of 22 points, but the overall analysis remains qualitative and descriptive.

Table 1

Website User Experience

Items	UOK	BBSUL	SMIU	HU	IU	HBU	Service Score	Service Availability %	Service Unavailability %
Contact details of the library	1	0.5	1	0	1	1	4.5	75%	25%
Features of live chat or virtual assistance	0	0	0	1	1	1	3	50%	50%

FAQs or self-help options	0	0	0.5	0	0	1	1.5	25%	75%
Details of library services	1	0	1	0.5	0	1	3.5	58%	42%
Service feedback option	0	0	0	0	0	0	0	0%	100%
Clear categories and menu options	1	0	1	0	0	1	3	50%	50%
Library activities updated on the website	0	0	0	0	0	1	1	17%	83%

Service Available = 1 Point, Limited or Incomplete Service = 0.5 Points, Service Not Available = 0 Points

As shown in Table 1, 75% of library websites provided clear contact details and 25% did not have or partial contact details. Live chat or virtual assistance feature, which is essential for user help & real-time user support, 50% of the libraries offered these features, but 50% did not have them. Self-help options, such as FAQs, are an essential feature for users to find answers to common queries without staff involvement. However, only 25% of websites have this feature, the remaining 75% either provide partial or do not include FAQs, which has restricted their website's self-service capability. Providing detailed information about library services is beneficial for students and researchers, only 58% of websites provided this information, remaining 42% did not have this information. Interestingly None of the libraries provided a service feedback option, meaning that users have no direct way to share their opinions or suggest improvements. This absence limits libraries' ability to adapt their services based on user needs. An organized and easy-to-navigate website improves user experience, 50% of websites have clearly structured categories and menus, remaining 50% lack clear navigation, making it harder for users to find relevant information. Website updates ensure that users stay informed about recent developments, events, and resources. Only 17% of websites actively updated library activities on their website, all other 83% of websites did not maintain this feature, resulting in outdated or static web content.

Table 2

Content Availability & Accessibility

Items	UOK	BBSUL	SMIU	HU	IU	HBU	Service Score	Service Availability %	Service Unavailability %
Remote access to digital resources/ HEC Digital Library	0	0	1	0	0	1	2	33.3%	66.7%
Online Public Access Catalog (OPAC)	0	0	1	1	0	1	3	50%	50%
Access to institutional repositories	0	0	0	0	0	0	0	0%	100%

Items	UOK	BBSUL	SMIU	HU	IU	HBU	Service Score	Service Availability %	Service Unavailability %
Availability of open-access collections	0	0	0	0	0	0	0	0%	100%
User-friendly search functionality	1	0	1	0	0	1	3	50%	50%
Citation management tools (Zotero, EndNote)	0	0	0	0	1	0	1	16.7%	83.3%
Availability of Library guides/tutorials	1	0	1	0.5	0	1	3.5	58.3%	41.7%
Clearly listed subscribed digital collections	1	1	1	1	1	1	6	100%	0%

Service Available = 1 Point, Limited or Incomplete Service = 0.5 Points, Service Not Available = 0 Points

Remote access to the HEC Digital Library or digital resources allows the students and faculty to access digital collections off-campus. Table 2 shows that only 33.3% of websites provided these services, and 66.7% of university websites did not offer this service, limiting accessibility for remote users. An Online Public Access Catalog (OPAC) is crucial for users to search for library materials efficiently. 50% of websites have this feature, whereas 50% lack OPAC. None of the library websites has links to institutional repositories, which limits access to locally produced research outputs such as theses, dissertations, and university publications also links to open-access collections are not found which means that users cannot get information about open-access materials. 50% of websites appeared user-friendly search systems & have effective search functionalities that are necessary for seamless navigation, while 50% did not provide a well-structured search option, making information retrieval more challenging for users. Only 16.7% offered citation management tools, and the remaining 83.3% did not provide this feature. Library guides and tutorials help users understand how to access and utilize digital resources effectively. 58.33% of websites offered material for this feature, while others provided partial resources or did not offer any guides, which can hinder user learning and engagement. Amazingly 100% of websites provided clearly listed subscribed digital collections, ensuring users can easily find and access e-resources available through institutional subscriptions.

Table 3

Website Design & Functionality

Items	UOK	BBSUL	SMIU	HU	IU	HBU	Service Score	Service Availability %	Service Unavailability %
Library link to the university homepage	1	0	1	1	1	1	5	83.3%	16.7%
The website loads efficiently and works across different devices	0.5	0.5	1	0.5	1	1	4.5	75%	25%
Availability of space for library news, announcements, and updates	0	0	1	0	0	1	2	33.3%	66.7%
Multimedia elements videos, infographics, virtual tours of the library	0	0	0	0	0	1	1	16.7%	83.3%
Features of Web 2.0 (Facebook, Twitter, YouTube)	1	0	0	1	1	1	4	66.7%	33.3%
Multiple languages support	0	0	0	0	0	0	0	0%	100%
The website is secure (https, authentication available)	1	1	1	1	1	1	6	100%	0%

Service Available = 1 Point, Limited or Incomplete Service = 0.5 Points, Service Not Available = 0 Points

A direct library link on the homepage of the website enhances the accessibility of the library, as shown in Table 3 related to website design & functionality 83.3% of university websites provided this feature, while 16.7% made it harder for users to locate the library page. Smooth loading and compatibility across different devices improve the user experience. 75% of websites have efficient performance, while the remaining 25% have moderate performance, indicating room for optimization. Only 33.3% provided space for library-related news, announcements, and updates, ensuring users stay informed. 66.7% of university library websites lack this feature, reducing engagement and communication. Multimedia features like videos, infographics, and virtual tours enhance interactivity. Only 16.7% included multimedia content, while all other 83.3% did not have this feature. Social media platforms like Facebook, Twitter, and YouTube help libraries connect with users. 66.7% of websites integrate these platforms, while the remaining 33.3% missed an opportunity for digital engagement. None of the university libraries offered multilingual support, which could improve accessibility for diverse user groups. This is a major area for improvement, but all university library websites have HTTPS security and authentication mechanisms ensuring safe access for users.

Comparative Analysis

All the library websites were assessed on the LibQUAL+ 22 items. A comparative analysis of the university library websites is presented below.

Table 4

LibQUAL+ 22 Items Checklist

Items	UOK	BBSUL	SMIU	HU	IU	HBU
1. Contact details of the library	1	0.5	1	0	1	1
2. Features of live chat or virtual assistance	0	0	0	1	1	1
3. FAQs or self-help options	0	0	0.5	0	0	1
4. Details of library services	1	0	1	0.5	0	1
5. Service feedback option	0	0	0	0	0	0
6. Clear categories and menu options	1	0	1	0	0	1
7. Library activities updated on the website	0	0	0	0	0	1
8. Remote access to digital resources/ HEC Digital Library	0	0	1	0	0	1
9. Online Public Access Catalog (OPAC)	0	0	1	1	0	1
10. Access to institutional repositories	0	0	0	0	0	0
11. Availability of open–access collections	0	0	0	0	0	0
12. User-friendly search functionality	1	0	1	0	0	1
13. Citation management tools (Zotero, EndNote)	0	0	0	0	1	0
14. Availability of Library guides/tutorials	1	0	1	0.5	0	1
15. Clearly listed subscribed digital collections	1	1	1	1	1	1
16. Library link to the university homepage	1	0	1	1	1	1
17. The website loads efficiently and works across different devices	0.5	0.5	1	0.5	1	1
18. Availability of space for library news, announcements, and updates	0	0	1	0	0	1
19. Multimedia elements videos, infographics, virtual tours of the library	0	0	0	0	0	1
20. Features of Web 2.0 (Facebook, Twitter, YouTube)	1	0	0	1	1	1
21. Multiple languages support	0	0	0	0	0	0
22. The website is secure (https, authentication available)	1	1	1	1	1	1
University Scores	9.5	3	12.5	7.5	8	17
Service Availability %	43.2%	13.7%	56.8%	34%	36.4%	77.3%
Service Unavailability %	56.8%	86.3%	43.2%	66%	63.6%	22.7%

Service Available = 1 Point, Limited or Incomplete Service = 0.5 Points, Service Not Available = 0 Points

There were following findings noted:

- A closer comparison shows in Table 4 that all three government universities included clear contact information on library websites, only two of the private universities IU and HBU offered clear contact details, while HU did not.

This is one of the most obvious differences between the quality of user support features between government and private university library websites.

- In comparison, self-help options like Frequently Asked Questions (FAQs) were poorly represented across all universities; only HBU provided this feature, while the remaining five universities either ignored a FAQ section or offered minimal information. This absence reduces the ability of users to independently resolve common queries, making them more dependent on contact with library staff.

- Live chat or virtual assistance, a feature that significantly enhances real-time user support, was more prevalent among private universities. All HU, IU, and HBU had this feature, while none of the government university websites offered a comparable service.

- The availability of comprehensive information on library services is another important component of user experience. The results indicate that 58% of the websites had adequate descriptions of their services; among government universities, UOK and SMIU made sure their websites had these details, while BBSUL did not; among private universities, only HBU listed all its library services in detail, while HU and IU did not.

- The lack of a service feedback option on all six university websites was one of the biggest gaps in the user experience; without a way for users to share their experiences or recommend changes, libraries lose out on the chance to improve their services based on real user needs.

- Only HBU among private universities showed a clear and well-organized website structure, HU and IU lacked this feature, while SMIU & UOK made it easier to navigate with a clear menu.

- Library website updates are essential for informing patrons about new resources, events, and advancements. However, this study discovered that only HBU kept its website updated with library activities; all other university libraries, both public and private, did

not do so. Web pages that lack updated content are stagnant and possibly out-of-date, which makes them less relevant to users.

- There was a significant difference in the availability of off-campus digital resources, only SMIU among government universities had this feature, while neither UOK nor BBSUL did; similarly, only HBU among private universities offered remote access, while HU and IU did not. This suggests that most students and faculty in both sectors still struggle to obtain off-campus research materials.

- In government institutions, SMIU offered OPAC, while UOK and BBSUL did not; among private universities, both HU and HBU offered this feature, while IU did not. This indicates that half of the universities offered a digital platform for users to efficiently search their library holdings.

- One of the most notable gaps in content accessibility was the complete lack of institutional repositories across all university websites; none of the six libraries offered access to university research outputs, such as theses, dissertations, or institutional published research.

- None of the websites featured open-access collections, which meant that users could not find freely available scholarly materials.

- The lack of user-friendly search functionality can make information retrieval more difficult, especially for new users. In the private sector, HBU had an efficient search interface, while in the government sector, UOK and SMIU websites were user-friendly.

- Citation management tools, which help researchers organize references using software like Zotero or EndNote, were only available on IU's library website; neither HU, HBU nor government sector universities linked this software. This limitation suggests that most university libraries do not prioritize research support features that could benefit faculty and students.

- Library guides and tutorials, which improve user understanding of available digital resources. Among government institutions, UOK and

SMIU offered these instructional materials, while BBSUL did not. In the private sector, HBU included comprehensive library guides, while HU and IU either offered limited content or lacked this feature entirely.

- Interestingly, all six universities, regardless of their sector, made sure that subscribed digital collections were clearly listed. This was the only area where there was complete uniformity, indicating that universities prioritize the visibility of their paid e-resources.
- Except for BBSUL, all five university websites had direct links on the university homepage. The absence of this functionality at BBSUL made it more difficult for users to find the library page.
- Private university libraries outperformed government institutions in terms of website efficiency and mobile compatibility; only SMIU had an optimally performing website in the government sector, while UOK and BBSUL had a moderately performing website.
- Multimedia elements videos, infographics, and virtual tours of the library, which guide users more about the library were only available on the HBU library website; neither HU, IU nor government sector universities had this feature.
- Only HBU's library used multimedia elements like videos, infographics, and virtual tours, while all other university libraries ignored these interactive features.
- One significant weakness in government university websites was the lack of social media integration; only UOK had Web 2.0 tools like Facebook, Twitter, and YouTube, while BBSUL and SMIU did not; among private universities, both HU and IU integrated these platforms, while HBU did not.
- None of the six universities supported multiple languages, indicating a shared limitation in accessibility for diverse linguistic groups.
- One area where government and private universities performed equally well was website security; all six library websites used HTTPS

encryption and authentication mechanisms, ensuring safe access for users.

Government universities are doing better at easy access to library contact information and service details, whereas private universities are better at offering organized search tools, interactive features, and real-time customer help. The lack of institutional repositories, open-access collections, multilingual support, and service feedback mechanisms are among the common gaps that both sectors must contend with. Resolving these issues would improve digital library services and general user experience in all of Karachi's universities.

Conclusion

Private universities generally perform better in areas like live chat features, social media integration, and search functionality, while government universities excel in providing clear service descriptions and structured website menus. This study compares the online library services provided by public and private universities in Karachi, revealing notable differences in user experience, content accessibility, and website functionality. Nonetheless, there are similarities and differences between the two sectors, especially when it comes to institutional repositories, open-access content, multilingual support, and systems for service feedback. The lack of these qualities restricts access to important scholarly resources and user involvement. Improving the function of digital library services in assisting higher education requires addressing these shortcomings.

Future Recommendations

- The interactive resources that are necessary for instant user support, like live chat, virtual help, and frequently asked questions should be incorporated with the website to enable self-service options and real-time communication.
- An online feedback system would enable libraries to collect feedback and make ongoing improvements to their service, it must be included.

- Universities should increase their remote access capabilities to guarantee that faculty and students may use digital resources off campus.
- University repositories of e-resources must be treated as a top priority for universities to support users.
- Digital content accessibility and usability must be enhanced by implementing advanced search filters, and user-friendly website structures.
- Citation management tools like EndNote and Zotero, should be provided through websites.

- Libraries should make sure that they provide timely updates on services, events, and new resources.
- For users of a variety of linguistic origins, different language options must be provided to improve accessibility for a wider audience.
- Libraries should integrate Facebook, Twitter, YouTube, and Instagram links on the website, including instructional videos, infographics, and virtual library tours, to create a more engaging and interactive experience.

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