

Library Management Practices in the Libraries of Pakistan

A Detailed Retrospective

Asim Ullah, Shah Khusro, and Irfan Ullah

ABSTRACT

Library and information science has been at an infant stage in Pakistan, primarily in resource management, description, discovery, and access. The reasons are many, including the lack of interest and use of modern tools, techniques, and best practices by librarians in Pakistan. Finding a solution to these challenges requires a comprehensive study that identifies the current state of libraries in Pakistan. This paper fills this gap in the literature by reviewing the relevant literature published between 2015 and 2021 and selected through a rigorous search and selection methodology. It also analyzes the websites of 82 libraries in Pakistan through a theoretical framework based on various aspects. The findings of this study include: Libraries in Pakistan need a transition from traditional and limited solutions to more advanced information and communication technology (ICT)-enabled, user-friendly, and state-of-the-art systems to produce dynamic, consumable, and sharable knowledge space. They must adopt social semantic cataloging to bring all the stakeholders on a single platform. A libraries consortium should be developed to link users to local, multilingual, and multicultural collections for improved knowledge production, recording, sharing, acquisition, and dissemination. These findings benefit Pakistani libraries, librarians, information science professionals, and researchers in other developing countries. To the best of our knowledge, this is the first study of its kind providing insights into the current state of libraries in Pakistan through the study of their websites using a rigorous theoretical framework and in the light of the latest relevant literature.

INTRODUCTION

With the inception of the Web, library and information science (LIS) professionals and researchers have solved several major challenges and issues regarding resource description, discovery, and access. Yet, many new problems arise in the practices and services delivered by libraries if they are not in line with emerging technologies and standards. These problems are promptly addressed by the libraries and their LIS professionals using cutting-edge technologies, sufficient training, and the availability of the required resources. This practice keeps these libraries functional and acceptable among their users, especially in developed countries. On the other hand, in less developed and developing countries, libraries are losing their importance, which may be due to the adherence of these libraries to outdated LIS approaches. Pakistan is one of the developing countries where this is often observed. But, before devising a solution to regain their value, importance, and acceptance, it is essential to identify the current state of libraries in Pakistan. To address this need, this paper reviews and summarizes the findings of the well-reputed published literature regarding libraries in Pakistan and collects and analyzes important details from library websites.

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This study is inspired by two review articles that considered different aspects of LIS research.¹ The most similar is the article from Noh and Chang, who analyzed LIS practices by reviewing relevant literature regarding libraries in Korea from 1970 to 2018.² However, to the best of our knowledge, we found no holistic, systematic literature review covering the current state of library management practices in Pakistan and highlighting its key challenges, issues, and research opportunities. Similarly, Ganaee and Rafiq studied the current state and features of the websites of the 85 academic libraries of Pakistan via surveys and interviews to identify their issues and problems.³ The websites were analyzed for contrasting color schemes, readable text, minimal use of horizontal scrolling, language, staff details, OPACs, navigation, and other details of the information architecture. Inspired by Ganaee and Rafiq, this study contributes a theoretical evaluation framework to study the current state of libraries by analyzing their websites. It comprises several aspects and criteria, including the availability of general information and information about resources and collections, the use of Web 2.0 tools, the design of the website, the offering of web-based services, the use of instruction tools, and the application of accessibility guidelines for supporting individuals with visual and other impairments. The paper extends the findings and implications of the aforementioned research by highlighting the current state of library management practices in the libraries of Pakistan, the challenges and issues those libraries face, and the research opportunities that lie ahead of them in the realm of modern digital technologies. The paper provides a systematic literature review of the relevant literature on the libraries of Pakistan and devises a theoretical framework to collect and analyze data by visiting the websites of the selected 82 libraries of Pakistan that have an online presence.⁴

The study has implications for researchers and LIS professionals in Pakistan and those of developing countries coping with similar challenges and issues. The first section of this paper presents the methodology for selecting relevant literature by adopting the well-known PRISMA framework.⁵ The second section presents a summary of key findings. The third section presents a discussion and analysis. The last section concludes the paper, followed by endnotes and an appendix holding data about the selected 82 websites of the libraries of Pakistan.

METHODOLOGY

This section discusses the literature search and selection strategy and the theoretical evaluation framework used to study the websites of the selected 82 libraries of Pakistan.

The Literature Search and Selection Strategy

This section discusses the search and selection process for collecting the relevant literature using Google Scholar. Google Scholar indexes more than 389 million records and has the highest coverage of knowledge and research areas.⁶ We developed rigorous search and selection criteria by adopting the PRISMA methodology for gathering the relevant scholarly literature.⁷ The PRISMA methodology is a systematic literature review approach, ensuring transparent and complete reporting on selecting relevant literature in a given course of inquiry.⁸ It tracks a full record of how the relevant literature was selected. It visualizes the details in a PRISMA flow diagram,⁹ shown in figure 1. The first step in applying PRISMA and following this diagram is to develop a search framework consisting of keywords or search queries that maximize the coverage and accuracy of finding relevant studies. The search framework for this study was developed by following Ullah and Khusro and Liberati et al.¹⁰ Table 1 summarizes the search framework and provides details on the search query and the number of total records matched by reading the

search results list's title and text snippet, which resulted in the number of relevant records reported in the third column. The duplicates that appear after entering the next search query are recorded in the fourth column. The duplicates are removed from the counting of relevant records matched against the given search query. The net results are reported in the final column to be further screened by title, abstract, and other details on the publisher's website. The inclusion/exclusion criteria are required to narrow down the selection criteria further so that only relevant items are included, and the irrelevant ones are filtered out or excluded. Using this search framework, our inclusion criteria selected the following publications:

- Publications that discuss computer and web-based software solutions regarding resource acquisition, description (cataloging), discovery, and access inside the library or libraries of Pakistan.
- Publications that highlight the use and the adaptation of technologies, especially modern cataloging practices, the use of Semantic Web, and Linked Open Data (LOD) in the libraries of Pakistan.
- Publications that highlight issues and challenges faced by Pakistani libraries to become part of the global library community and learn from their best practices in terms of software and related technologies.
- Publications in the English language with Pakistani context and published during 2015–2021.

The exclusion criteria to remove items from the list included the following:

- Publications published before 2015 and written in languages other than English.
- Publications that are of low academic significance with low-quality publication venues. Examples include papers having incomplete details or those published in non-peer-reviewed journals and conferences.
- Theses, dissertations, surveys, review articles, patents, and citations.

Table 1. The search framework – keywords and criteria for finding relevant publications

S. no.	Search query	Records matched	Relevant records by title & text snippet	Duplicates identified	Net items to be screened by title & abstract
1.	“library science”, “information science”, “LIS”, “libraries”, “Pakistan”	963	15	0	15
2.	“academic libraries”, “university libraries”, “digital libraries”, “Pakistan”	645	48	2	46
3.	“library staff”, “training”, “resources”, “library automation”, “libraries”, “Pakistan”	355	26	15	11
4.	“libraries”, “university libraries”, “HEC”, “digital library”, “Pakistan”	258	71	39	32
5.	“collection management”, “collection development”, “libraries”, “Pakistan”	240	11	11	0
6.	“design”, “accessibility”, “usability”, “responsiveness”, “websites”, “libraries”, “Pakistan”	109	3	0	3
7.	“social networking”, “social web”, “libraries”, “Facebook”, “Twitter”, “YouTube”, “Pakistan”	93	0	0	0
8.	“services”, “web 2.0”, “rating”, “review”, “comment”, “libraries”, “Pakistan”	75	1	1	0
9.	“library automation”, “computerization”, “library software”, “libraries”, “Pakistan”	76	5	5	0
10.	“automation”, “Integrated library systems”, “library software”, “Pakistan”	68	8	7	1

S. no.	Search query	Records matched	Relevant records by title & text snippet	Duplicates identified	Net items to be screened by title & abstract
11.	"Azad Jammu and Kashmir", "Punjab", "Sindh", "Khyber Pakhtunkhwa", "Balochistan", "Gilgit", "libraries", "Pakistan"	30	0	0	0
12.	"digitization", "digital skills", "digital competencies", "libraries", "Pakistan"	29	4	3	1
13.	"book selection", "acquisition", "classification", "cataloging", "libraries", "Pakistan"	17	2	1	1
Total		2958	194	84	110

Figure 1 visualizes the search process using the well-known PRISMA diagram.¹¹ Google Scholar retrieved 2,958 records. The search queries brought 84 duplicate records identified and removed, leading to 2,874 records left for initial screening. After an initial screening using title and text snippets, we identified 110 records to be relevant, leaving a total of 2,764 records. These 110 records were then accessed by visiting their publisher's websites to read their title, abstract, and other details. The full texts of these papers were obtained. After applying skimming on the full-text of these records and considering the inclusion/exclusion criteria, 26 were excluded leaving behind 84 publications for in-depth reading and analysis. An in-depth reading of these 84 articles and application of the inclusion/exclusion criteria identified a further 3 articles to be irrelevant, leaving behind 81 articles to be relevant and to be included in the analysis and discussion.

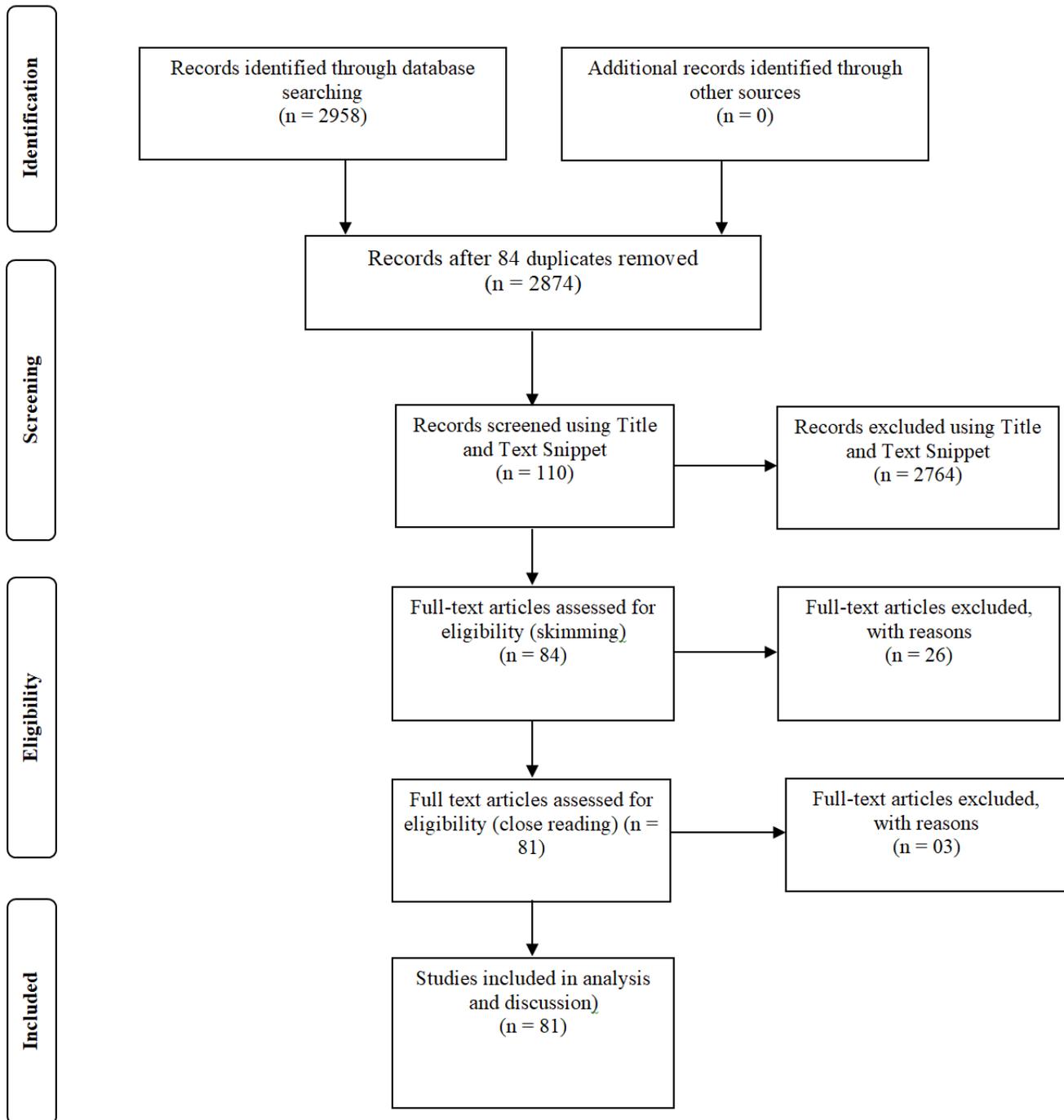


Figure 1. PRISMA diagram regarding the selection of relevant publications.

The Evaluation Framework

The theoretical evaluation framework used to collect relevant data from the selected websites is shown in table 2. It summarizes the purpose of each criterion and its possible values using abbreviations.

Table 2. The evaluation framework for libraries: Criteria and their descriptions

S. No.	Criteria	Explanation
1.	S. no.	The serial no. of each record in table A-1 of Appendix A: Details of libraries
2.	Library name	Purpose: The name of the library. Values: library name
3.	URL	Values: The URL of the library. Values: URL
4.	Library website design ¹²	Purpose: Whether the website design is kept user-centered and accessible for the blind and visually impaired people. Values: language clarity (Lc: Yes/No); presentation clarity (Pc: Yes/No); support for special people (Sp: Yes/No); logical structure (Ls: Yes/No); responsive web design (Rwd: Yes/No); multilinguality (MLw) of web pages (Yes/No)
5.	General information ¹³	Purpose: General information available on the website regarding content. Values: copyright statement (C); resources and services (Rs); mission/goals/objectives (G); news/events (Ne); contact details (Cn); frequently asked questions (FAQ); last updated (Lu); map/directions to the library (Mp); calender (Cl); virtual tour (Vt); policies (P); word cloud (Wc); opening hours details (Oh), not available (NA)
6.	Web 2.0 tools ¹⁴	Purpose: The purpose of Web 2.0 tools is to connect the library users and get updates from the library management about different contents demanded or needed by the library users. Users can share and comment on the library holdings in their friends' circle through these social networking applications. This criterion is set for analyzing whether social networking applications are used in Pakistani libraries or not and which social networking tool is mostly used. Values: Facebook (FB); Flickr (Fr); Twitter (T); RSS (R); social bookmarking (S); Instagram (I); blogs (B); wikis (W); YouTube (Yt); Pinterest (Pi); not available (NA)

S. No.	Criteria	Explanation
7.	Web-based library services ¹⁵	<p>Purpose: The services offered by the library on the Web. It has subcolumns including Search, Browsing, and Other.</p> <p>Search, values: OPAC; author (at); title (tt); subject (su); keyword (ke); and advanced search (as)</p> <p>Browsing, values: author (at); title (tt); subject (su); category (ca); keyword (ke)</p> <p>Other, values: Ask a librarian (Al); email (Em); loan (Ln); awareness (Aw); newsletter (Nw); delivery (De); SMS; ready reference questions (Rq); chat (Ch); library exhibits (Lx); Feedback (Fb); reserving computers (Rc); council services (Cs); smartphone-based services (Sp); not available (NA)</p>
8.	Resources and collections ¹⁶	<p>Purpose: This criterion aims to analyze the nature, variety, and types of the resources that are mostly available in Pakistani libraries.</p> <p>Values: OPAC; bibliographic databases (Bd); full-text databases (FT); journals (J); books (B); audiobooks (Ab); magazines (Mg); online reference sources (Or); OPAC of other libraries (OPAC-O); multimedia collections (Mc); other (O); special collections (Sc); multilinguality (MLr) of resources; not available (NA); information of physical resources (Ph)</p>
9.	Instructional tools ¹⁷	<p>Purpose: Tools to guide users in searching, browsing, and other services.</p> <p>Values: research guides (Rg); subject guides/pathfinders (Sg); OPAC search tips (tips); information literacy program (Infl); citation guides (Cg); online tutorials (Ot); user groups (Ug); plagiarism guides (Pg); webinars (Wb); not available (NA)</p>
10.	Accessibility guidelines ¹⁸	<p>Purpose: Whether the website and library follows the accessibility guidelines</p> <p>Values: Yes/No</p>

SUMMARY OF KEY OBSERVATIONS

The LIS practices in Pakistan's libraries are gradually shifting from manual to digital. However, they are still far from meeting the latest international practices of resource management, acquisition, cataloging, classification, circulation, discovery, access, and accessibility for people with disabilities, including those with visual impairments. This section has a twofold objective. First, it reviews the latest literature regarding the current state of LIS practices in the libraries of Pakistan to identify challenges and issues being faced and future research opportunities. Second, it

extends these findings by evaluating the websites of the selected 82 libraries for a clearer picture of the current state of these chosen libraries.

LIS Practices in the Light of Published Literature

This section discusses LIS practices in the libraries of Pakistan with details from the published literature. The following subsections briefly discuss these practices.

Collection Development and Management

Books are given greater importance as the main holdings in the libraries of Pakistan. Currently, printed books are selected in the conventional manual manner. Book selection tools include suppliers' lists, publishers' catalogs, book fairs/visits to book shops, book reviews, recommendations from the readers, selection committees, suggestion registers, and publishers/suppliers' desk copies. The requested books are supplied to the libraries. Librarians check these books physically and verify their accuracy. If a book is damaged or not present, it is reported to the vendor so that new copies could be arranged. There is a rare case of online or electronic book selection and procurement from national and international book vendors. There is also a very rare practice of purchasing softcover books in batches. These aspects have been discussed in several research publications by LIS professionals and researchers of Pakistan. One prominent reason is the lack of a sufficient budget and standard clear resource acquisition and management policy.¹⁹ The following are some of the notable challenges and issues that appeared in the published literature:

- The development of the quality collection.²⁰
- Lack of formal policies and guidelines for collection selection, acquisition, and related activities.²¹
- Lack of electronic resources²² and challenges in their subscription and off-campus access.²³
- Inadequate collections and the resulting limited use of resources.²⁴
- Financial constraints.²⁵
- Lack of formal policies and procedures for collection development and management, including selection, acquisition, digitization, and access.²⁶
- Lack of proper library communities and the coordination among them for collection development and management.²⁷
- Failure to fulfill the user information needs.²⁸

Researchers have made some recommendations (that could also be treated as research opportunities) to address these challenges: The libraries need to meet user needs and maintain their pace for disseminating the current and updated scientific knowledge and new insights in the literature to achieve excellence in service delivery.²⁹ The factors affecting LIS practices in the academic libraries of Pakistan include collection development goals, management policies, and procedures, user requirements, budget, and evaluation.³⁰ The user information needs should be considered to the fullest, and a user-centric approach should be developed to improve content selection.³¹ Librarians should understand the use of linked and open data (LOD) for creating standard metadata records for information resources management in libraries.³² In this regard, the librarians should consider the major challenges, including the lack of technical expertise, awareness of the latest tools and technologies, the complexity of technologies, non-availability of vocabularies, and legal issues.³³ The librarians must consider the research community's limited

demand and use of e-resources in academic activities.³⁴ There is a significant relationship between the digital resources database and the development of academic research for generating innovative ideas and improving researchers' cognitive abilities.³⁵ Therefore, libraries must be well aware of maintaining sufficient and up-to-date resources. Social networking sites should be considered for knowledge management practices among the employees in public and private universities.³⁶ Effective policies should be developed to increase the researchers' satisfaction and research productivity.³⁷

Resource Description, Discovery, and Access

As it relates to resource description and access, most libraries in Pakistan use online public access catalogs (OPACs). The use of specialized software, including, e.g., DSpace and e-Prints, for developing and using institutional repositories and digital libraries is rare. Libraries are still relying on the conventional manual, partially computerized, slow, and old methods of records management and are limited to OPACs-based search and retrieval. They are less aware and familiar with the modern best practices of using LOD for resource description, sharing, and access. It is unproven and new to the libraries of Pakistan for several reasons, including the complexity in deployment and usage and the constraints on financial and human resources.³⁸ Some of the notable challenges and issues that appeared in the published literature include the following:

- Lack of or limited searching and access to resources³⁹ and their sharing.⁴⁰
- Lack of synchronous or digital reference services⁴¹ and the poor availability of virtual reference services.⁴²
- Lack of search and retrieval solution for multilingual resources written in Pashtu, Arabic, and Urdu.⁴³
- Limited or no use of big data analytics to improve acquisition, preservation, curation, and data analysis.⁴⁴
- Insufficient information on the websites regarding their libraries and lack of communication support for end users.⁴⁵
- Less frequent use of Web 2.0, website aid tools, and limited information about their libraries.⁴⁶
- The smaller size of the library website and the lack of aids including site index, frequently asked questions, user guides about its use.⁴⁷
- The lack of awareness, best practices, IT staff, and the complexity in implementing LOD in resource description, discovery, sharing, and access.⁴⁸

These challenges can be addressed if the recommendations of the researchers are considered. Some of these recommendations, which also serve as research opportunities, include: The library management practices should consider using and exploiting ontologies and LOD to develop more rigorous classification systems for improved resource description, discovery, and access.⁴⁹ Strategic planning and policies are essential for incorporating ICT in the libraries of Pakistan, with emphasis on resource description, discovery, access, and sharing through web-based services.⁵⁰ Besides the library's reference desk and e-mail service, the online instant messaging and search engines tools must be used for virtual reference service (VRS) in libraries. A proper set of written policies and standard operating procedures (SOPs) for VRS must be introduced.⁵¹ The collaboration and sharing of experiences and skills for deploying LOD is also vital.⁵² Through LOD, the libraries of Pakistan can be linked to other global libraries to promote our indigenous

literature on the Web.⁵³ It is challenging to migrate data from text-based and MARC catalogs to linked data formats. In addition, the recognition and providence of the URIs are challenging. Synchronizing terminologies with linked data technology and minimizing its complexity is also challenging. The conversion of MARC 21 records to resource description framework (RDF) is onerous.⁵⁴ A list of the bibliographic databases should be provided on the library website with instructions for their usage and relevant content should be made accessible discipline-wise through proper authentication login.⁵⁵ Services like “ask a librarian,” search, searching via barcode scanners, and maintaining a rich database should be considered by each library through their online and mobile phone interfaces.⁵⁶ In developing smartphone-based library applications, it is essential to consider service quality, affinity, usefulness, ease of use, satisfaction, confirmation, and continuous usage.⁵⁷ The information architecture of libraries’ websites should be analyzed from the perspective of their users, and their navigation system should be improved and adapted accordingly.⁵⁸ The usefulness and cost are the most influential factors that should be considered while adopting library software such as Koha.⁵⁹ The design and quality of the contents and services of the library website are important.⁶⁰ The use of digital library resources positively impacts research productivity and should be considered.⁶¹

Adherence to New Standards, Practices, and Technologies

The lack of interest from library staff in adopting and adhering to new standards and technologies is another inevitable aspect. Another reason for this non-adherence could be the lack of knowledge by upper management and failure to understand the modern-day needs of library users. However, some developments are taking momentum. For example, several libraries offer web-based services.⁶² In some scenarios, university students use the social Web to access and share resources.⁶³ The Pakistan Scientific and Technological Information Center (PASTIC) is developing a searchable database of indigenous collections⁶⁴ supporting smartphone-based search and access.⁶⁵ PASTIC is also creating a consortium-level public access catalog of the scientific periodicals produced by the authors of Pakistan.⁶⁶ The Agha Khan University has developed an integrated resource management system for connecting different, geographically dispersed libraries of various campuses in Pakistan.⁶⁷ Access to digital libraries through the Higher Education of Pakistan (HEC) digital library, a library management system, and e-document delivery are some of the notable innovations in the LIS domain of Pakistan.⁶⁸ There are 122 public universities, 95 private universities, and more than 600 non-degree-awarding institutions with HEC-DL access.⁶⁹

The LIS practices in Pakistani libraries mostly suffer from the lack of professional training,⁷⁰ awareness of the latest library standards and technologies,⁷¹ technological and IT proficiency,⁷² policies for library processes and ICT,⁷³ knowledge regarding LOD technologies,⁷⁴ engagement with digitization activities,⁷⁵ resource sharing, and collaboration,⁷⁶ sufficient financial resources,⁷⁷ the supportive and assistive atmosphere for persons with special needs,⁷⁸ as well as issues regarding archiving, cataloging, and disseminating local and indigenous literature and artifacts.⁷⁹

A library must find ways of adapting new tools, standards, technologies, and necessary training to support users in resource management, discovery, and access. The HEC Pakistan maintains one such library to offer free access to research publications and periodicals in different universities of Pakistan and their scholars for off-campus online access.⁸⁰ However, most university library users are not fully satisfied with collection development, and a major part of the literature is still not

accessible.⁸¹ Besides, as discussed, PASTIC is playing its active role in developing a library consortium and a searchable database/catalog of the indigenous collections of Pakistan. Several university librarians have adopted knowledge management practices to deliver and improve their library services efficiently.⁸² Apart from these few initiatives, the research and development of LIS practices in the libraries of Pakistan have been at very minimum and need significant attention.

Some of the notable challenges and issues that appeared in the published literature include

- Librarians have limited or outdated knowledge regarding research data management.⁸³
- The inappropriate infrastructure.⁸⁴
- Limited or no use of ICT, knowledge, and expertise in the use of computers, internet connectivity issues, inadequate computer labs.⁸⁵
- Training and leadership.⁸⁶
- Lack of supporting IT staff.⁸⁷
- Lack or limited use of human resource management⁸⁸ and leadership.⁸⁹
- Financial constraints.⁹⁰
- Lack of dynamic websites for the libraries.⁹¹
- Lack of tools and standard library software.⁹²
- The very basic level of digital competencies for developing, managing, and protecting digital libraries in universities of Pakistan.⁹³
- Lack of uniformity and standard features in library websites.⁹⁴
- There is less frequent use of Web 2.0, website aid tools, and limited information about their libraries.⁹⁵
- The smaller size of the library website and the lack of aids including site index, frequently asked questions, user guides about its use.⁹⁶
- The relative infant stage of information commons (information technology infrastructure, services, and resources).⁹⁷
- Negligible willingness and interest in research data management.⁹⁸
- Reluctance in sharing research data⁹⁹ and weak and informal collaboration on research.¹⁰⁰

Some recommendations (that could also be treated as research opportunities) made by researchers include: services, including electronic services, librarian's end services, and technical knowledge services, should be improved in the special libraries of Pakistan.¹⁰¹ It is essential to understand the need to deploy and use library software, including, e.g., KOHA, DSpace, e-Prints, and Evergreen.¹⁰² Human resource management, especially effective leadership with a broader vision, boldness, charismatic personality, and knowledge dissemination abilities, is required to lead staff and manage their social relationships.¹⁰³ As an information manager of the library, a librarian must be fully aware of Web 3.0, the Semantic Web, and artificial intelligence (AI) tools to become expert in the digital landscape.¹⁰⁴ Web 2.0 tools and social networking sites should be used in marketing and advertising the library services to the end users.¹⁰⁵ The cataloging paradigms should incorporate social collaborative cataloging metadata.¹⁰⁶ Artificial intelligence tools and services should be considered where LIS professionals can collaborate and join hands with computer science professionals to develop libraries.¹⁰⁷ Academic libraries' performance can be improved by using big data tools and analytics.¹⁰⁸ Quality enhancement and industrial affiliation are important for increasing the quality and quantity of research in academia.¹⁰⁹ The

digital library, institutional repository software, bibliographic databases, e-journals searching, and referencing tools are very important for increasing the research production of the public sector universities.¹¹⁰ The competencies of ICT skills, education in copyright laws and intellectual property, using digital and physical learning resources, and collection development must be improved.¹¹¹ HEC must provide funds for information commons projects for significant benefits to library users.¹¹²

LIS Practices in the Light of the Studied Websites

This section attempts to highlight the current state of the libraries in Pakistan through data and observations collected from their websites. Reviewing a library's website reveals several aspects of its current state. Table A-1 in Appendix A summarizes the collected data obtained through the evaluation framework discussed in the methodology section and summarized in table 2. For example, a library with a website that is not user-centered and accessible to people with visual impairments, a criterion outlined as the third item in table 2, may face issues with supporting IT staff, lack of expertise, and budget constraints. A library that is unable to offer web-based services cannot meet the needs of a major portion of its users interested in accessing content and services online. A similar impact is connected to each of the remaining criteria of the evaluation framework. The lack of certain pieces of information on the library website affects their users negatively and may restrain them from using it. It is notable that most of the libraries of Pakistan have no websites at all, which makes it challenging to discuss their strengths and limitations. As shown in figure 2, only **36%** (of the selected 82 websites) of the libraries listed on the HEC website have websites leaving **64%** that have no online presence. This also makes it challenging to draw a clearer picture of the current state of libraries of Pakistan and, therefore, the statistics presented here depict only a rough estimation of the exact details.

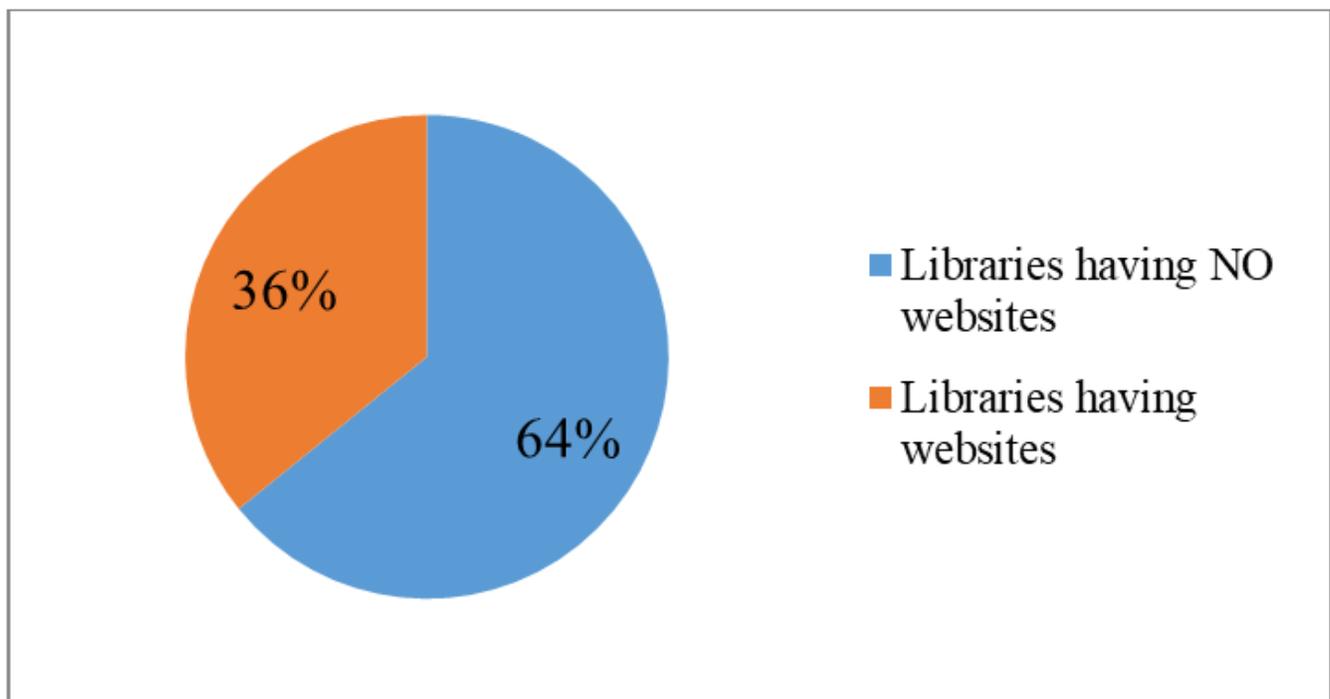


Figure 2. Percentage of libraries in Pakistan with and without websites.

Figure 3 shows the statistics concerning the appearance and design of library websites in Pakistan, which are improving in language and presentation clarity, logical structure, responsive web design, and access to the HEC digital library. These websites need improvement in providing accessibility tools for people with disabilities, meeting accessibility guidelines, and incorporating multilingual support.

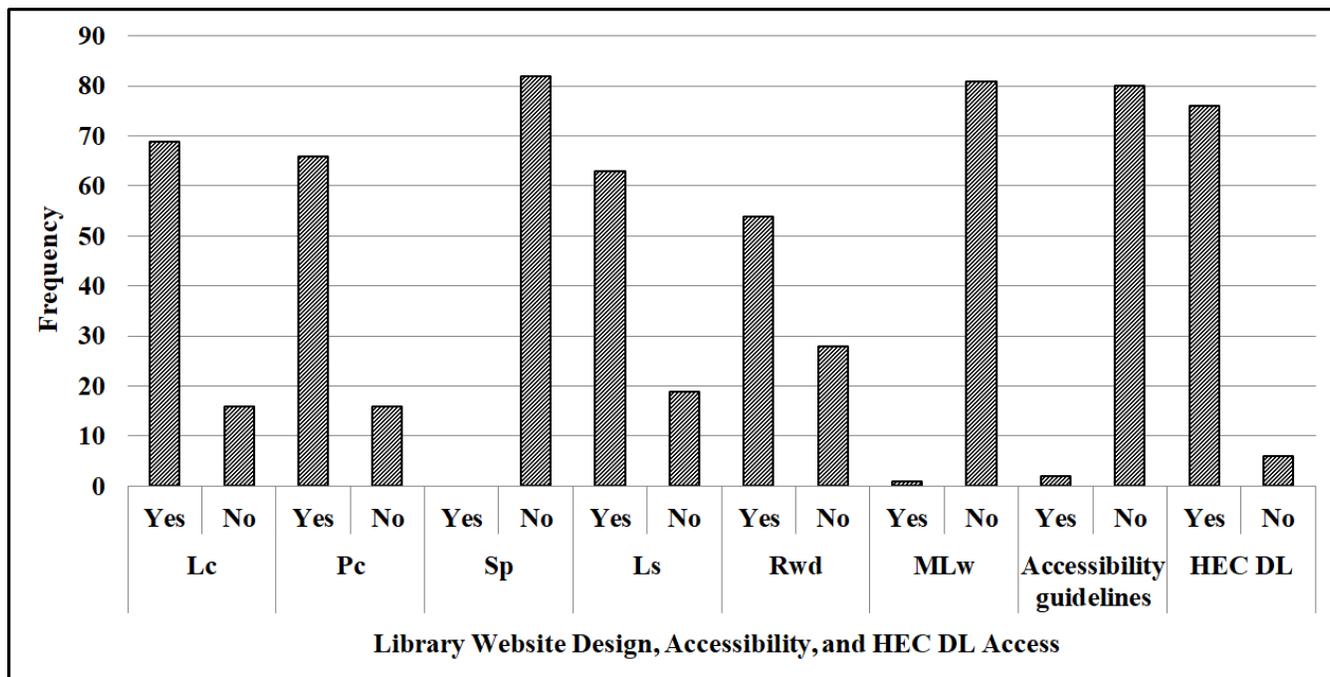


Figure 3. Library website design, accessibility, and access to HEC digital library (Lc: language clarity; Pc: presentation clarity; Sp: support for special people; Ls: logical structure; Rwd: responsive web design; MLw: multilinguality of web pages; Accessibility guidelines; and HEC DL Access).

Figure 4 shows that most of the libraries (63 out of 82: **76.8%**) offer general information on their websites. The most prominent among these include contact details (50 out of 82: **61%**), copyright statement (47 out of 82: **57.3%**), and library operating hours (46 out of 82: **56.09%**), followed by resources (27 out of 82: **32.9%**), news/events (25 out of 82: **30.5%**), mission/goals/objectives (24 out of 82: **29.3%**), and maps/directions to the library building (19 out of 82: **23.2%**), policies (18 out of 82: **22%**), frequently asked questions (16 out of 82: **19.5%**), and last update (12 out of 82: **14.6%**). The virtual tour, calendar, and word cloud are the least provided, as shown. Finally, a considerable number of libraries (19 out of 82: **23.2%**) lack most of the general information.

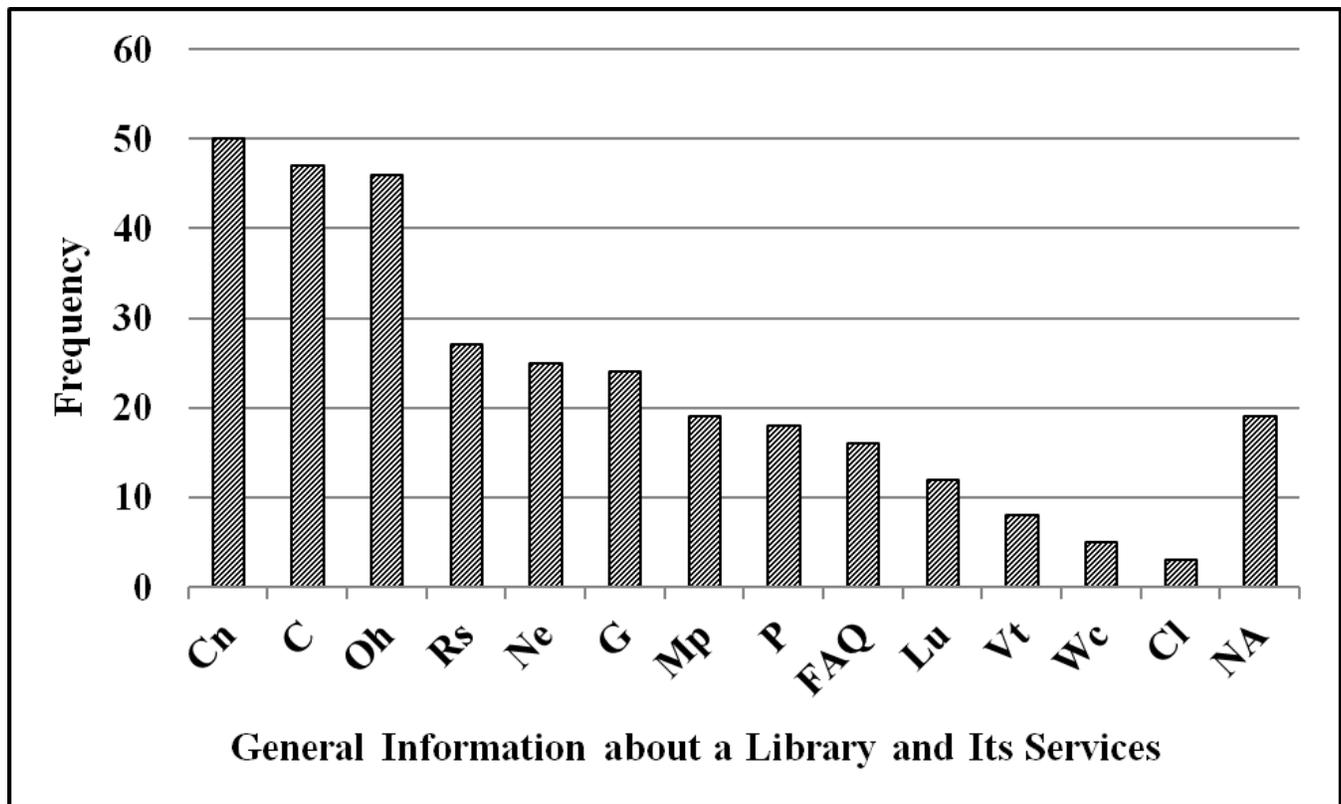


Figure 4. Number of library websites that offer general information to its users about Cn: contact details; C: copyright; Oh: opening hours details; Rs: resources; Ne: news/events; G: mission/goals/objectives; Mp: map/directions to the library; P: policies; FAQ: frequently asked questions; Lu: last update; Vt: virtual tour; Wc: word cloud; Cl: calendar; and NA: not available.

Figure 5 shows the details of the libraries that allow sharing their contents or communicating with their users using Web 2.0 tools and social media. Most of the libraries (53 out of 82: **64.6%**) are not connected with their users through social networking. Most of the libraries that exploit Web 2.0 tools, use Facebook (26 out of 82: **31.7%**), followed by Twitter (22 out of 82: **26.8%**), YouTube (9 out of 82: **11%**), Instagram (8 out 82: **9.7%**), and RSS (5 out of 82: **6.1%**).

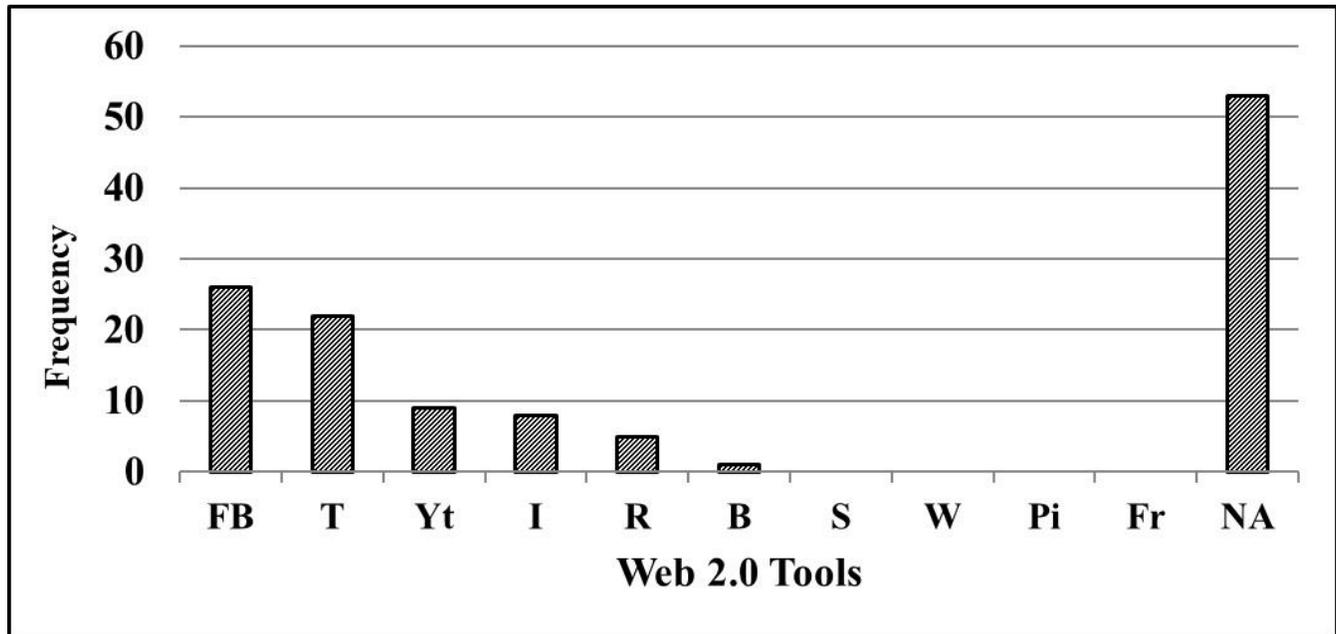


Figure 5. Number of library websites that provide social networking through FB: Facebook; T: Twitter; Yt: YouTube; I: Instagram; R: RSS; B: blog; S: social bookmarking; W: wikis; Pi: Pinterest; Fr: Flickr; NA: not available.

Figure 6 shows the statistics for the instructional tools used by different websites of libraries in Pakistan. These tools are for the new visitors or the person who requires instruction in navigation, search, and access to the contents of the library’s website. Most of the libraries (67 out of 82: **81.7%**) do not offer instructional tools on the websites. Only a few (15 out of 82: **18.3%**) provide instructional tools in one form or the other. These include information literacy programs (10 out of 82: **12.2%**), citation guides (7 out of 82: **8.5%**), research guides (6 out of 82: **7.3%**), subject guides/pathfinders (4 out of 82: **4.8%**), tutorials (3 out of 82: **3.6%**), OPAC search tips (3 out of 82: **3.6%**), webinars (2 out of 82: **2.4%**), program guides (2 out of 82: **2.4%**), and user guides (1 out of 82: **1.2%**).

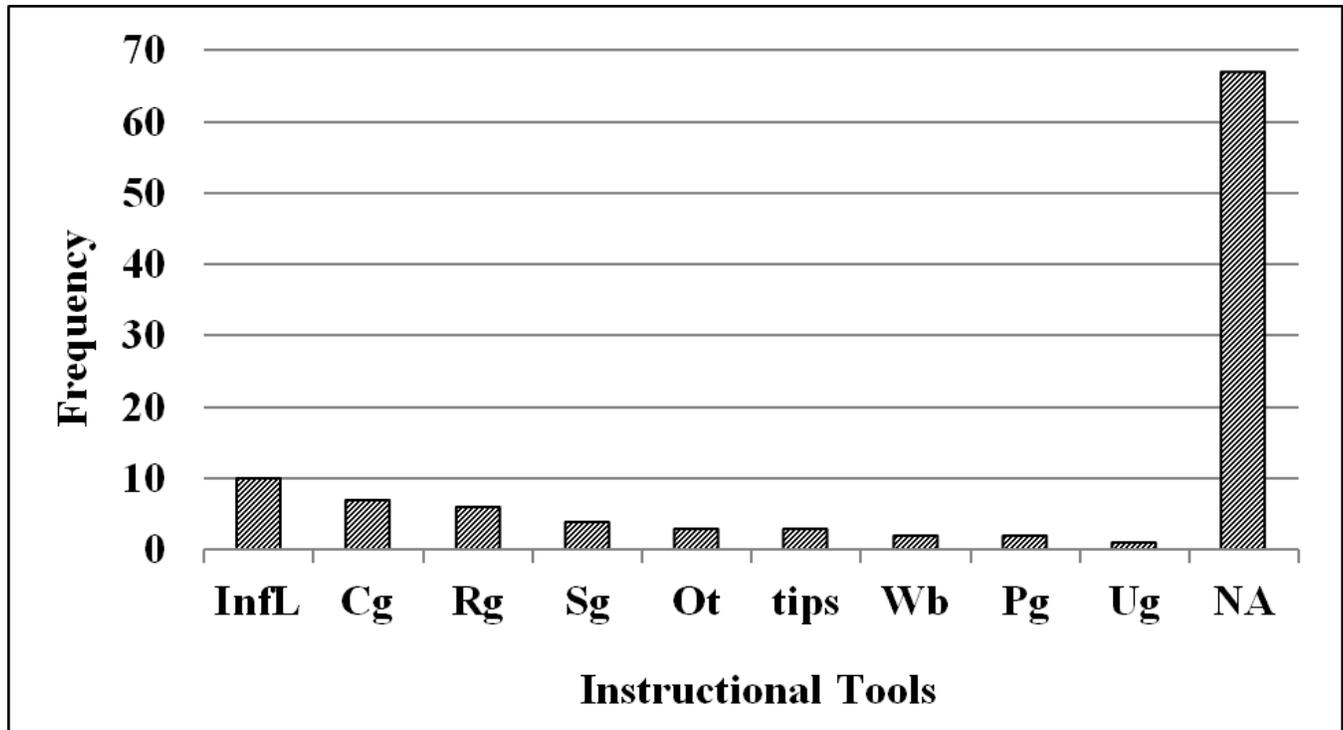


Figure 6. Number of library websites that provide the instructional tools of InfL: information literacy program; Cg: citation guides; Rg: research guides; Sg: subject guides/pathfinders; Ot: online tutorials; tips: OPAC search tips; Wb: webinars; Pg: plagiarism guides; Ug: user groups; NA: not available.

Figure 7 shows the statistics about searching as part of web-based services provided by different libraries on their websites. Most libraries (53 out of 82: **66.2%**) offer search using keywords (44 out of 82: **53.6%**) followed by title (42 out of 82: **51.2%**), advanced search (39 out of 82: **47.6%**), authors (38 out of 82: **46.3%**), subjects (36 out of 82: **43.9%**), and OPAC (5 out of 82: **6.1%**). A considerable number of libraries (29 out of 82: **35.4%**) have no search functionality.

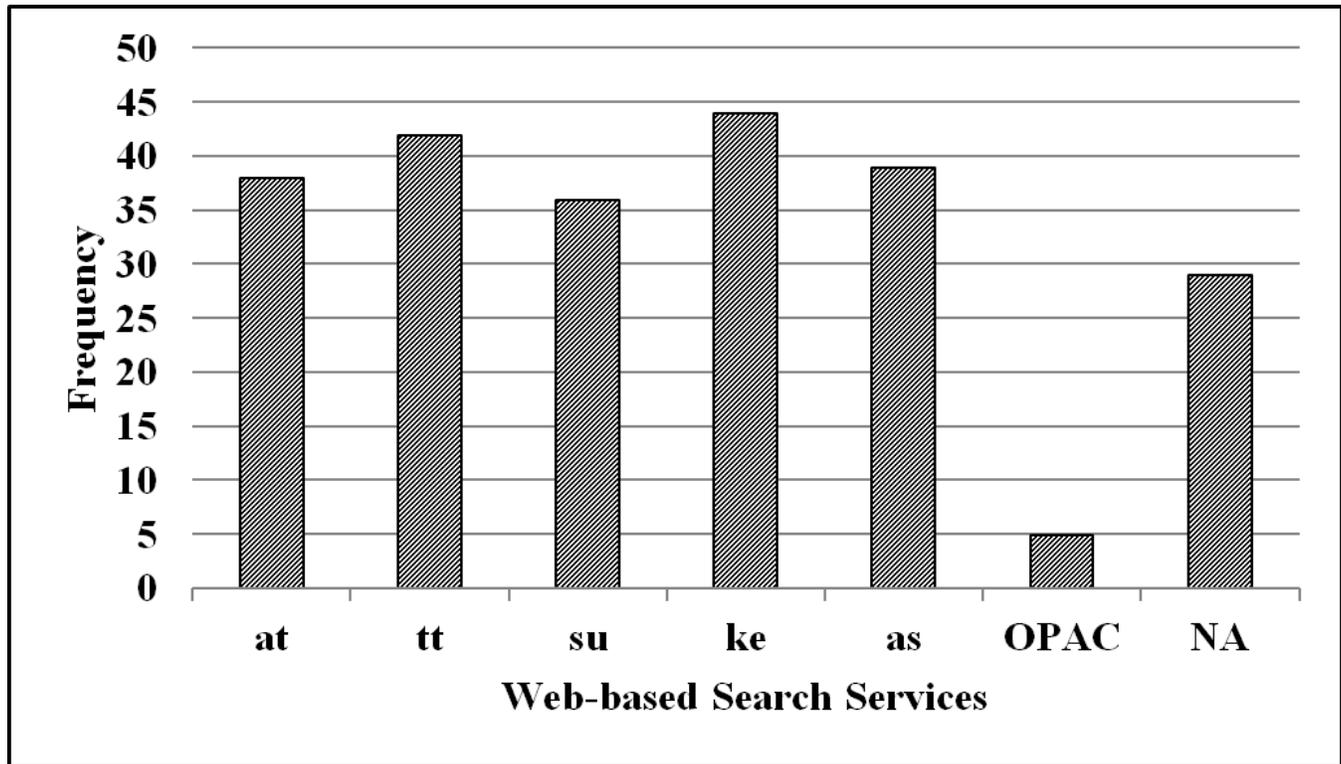


Figure 7. Number of libraries offering web-based searching services through at: author; tt: title; su: subject; ke: keyword; as: advanced search; OPAC; NA: not available.

Figure 8 shows that most libraries' websites (53 out of 82: **64.6%**) offer browsing using different options and filters. Most libraries allow browsing through categories (42 out of 82: **51.5%**) followed by the title (40 out of 82: **48.8%**), author (38 out of 82: **46.3%**), subject (36 out of 82: **43.9%**), and keywords (28 out of 82: **34.1%**). Several libraries (29 out of 82: **35.36%**) offer no such browsing functionalities.

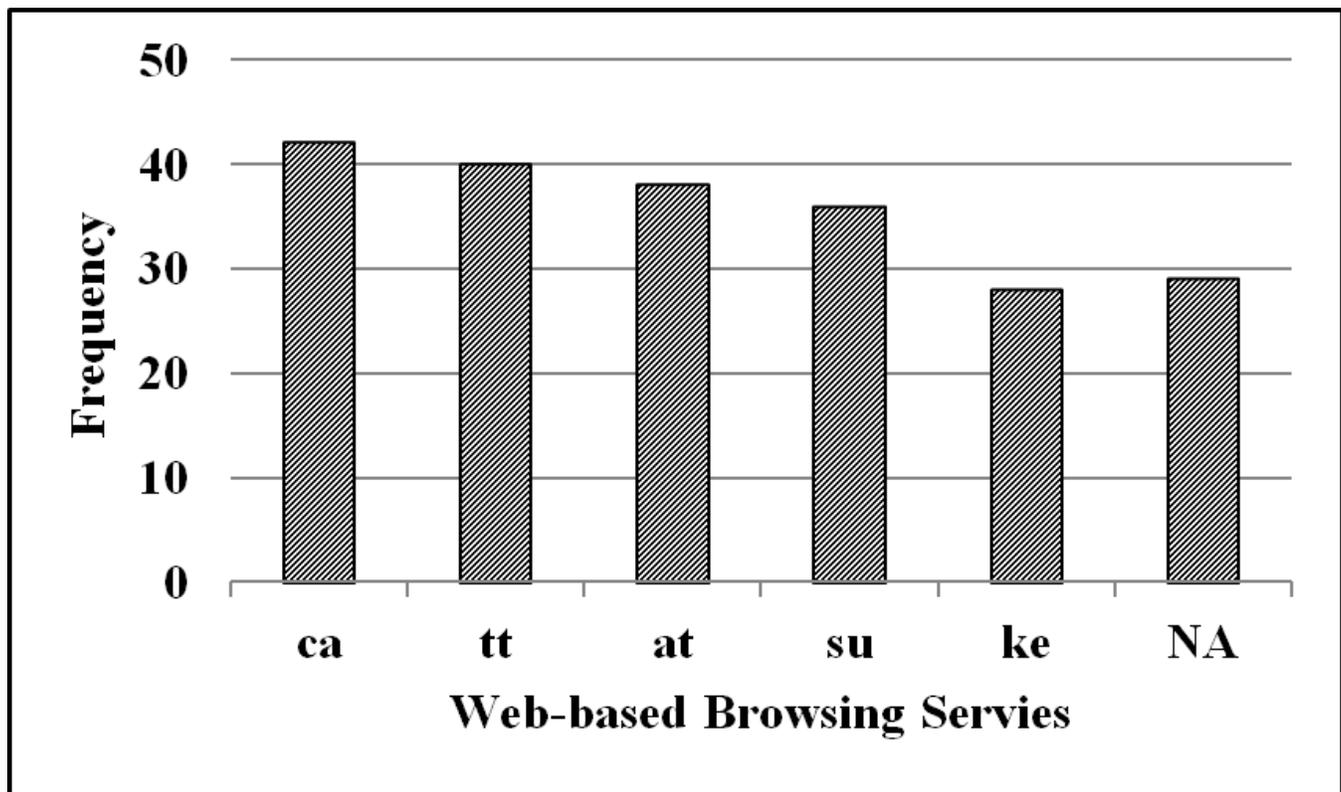


Figure 8. Number of libraries offering web-based browsing service parameters including ca: category; tt: title; at: author; su: subject; ke: keyword; NA: not available.

Figure 9 shows the statistics for web-based services offered by libraries other than search and browsing, which are depicted separately in figures 7 and 8, respectively. Most libraries (63 out of 82: **76.8%**) do not offer these services on their websites. Only a few of them (19 out of 82: **23.2%**) offer services such as Ask a librarian (14 out of 82: **17.1%**), followed by email, delivery (9 out of 82: **11%** each), loan (6 out of 82: **7.3%**), chat, ready reference questions (4 out of 82: **4.9%** each), and spreading awareness among users (3 out of 82: **3.6%**). The remaining services such as newsletter, reserving computers for the users, council services, smartphone-based services, and short messaging service are offered on almost none of the selected libraries' websites.

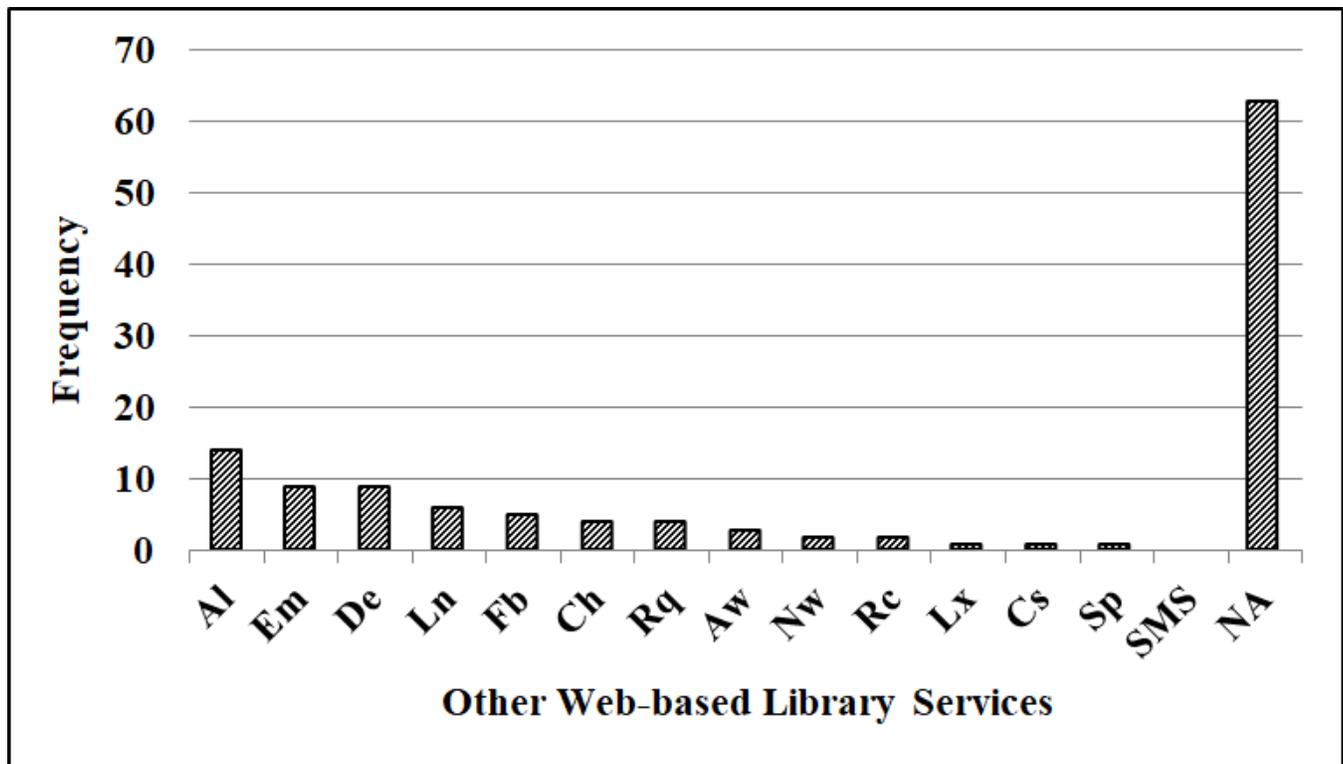


Figure 9. Number of libraries offering other web-based library services that provide support for accessing and discovering any service or resource other than search and browsing. These services include Al: Ask a librarian; Em: email; De: delivery; Ln: loan; Fb: feedback; Ch: chat; Rq: ready reference questions; Aw: awareness; Nw: newsletter; Rc: reserving computers; Lx: library exhibits; Cs: council services; Sp: smartphone-based services; SMS; NA: not available.

Figure 10 shows the details offered by libraries about their resources and collections. A considerable number of these libraries (20 out of 82: **24.4%**) provide no such information. Most libraries (62 out of 82: **75.6%**) give details about books (45 out of 82: **54.8%**), followed by journals (39 out of 82: **45.6%**), bibliographic databases (37 out of 82: **45.1%**), OPAC (17 out of 82: **20.7%**), full-text databases (10 out of 82: **12.2%**), magazines (9 out of 82: **11%**), physical books (7 out of 82: **8.7%**), online reference services (6 out of 82: **7.3%**), OPAC of other libraries (3 out of 82: **3.7%**), audiobooks (2 out of 82: **2.4%**), and multimedia collections (1 out of 82: **1.2%**).

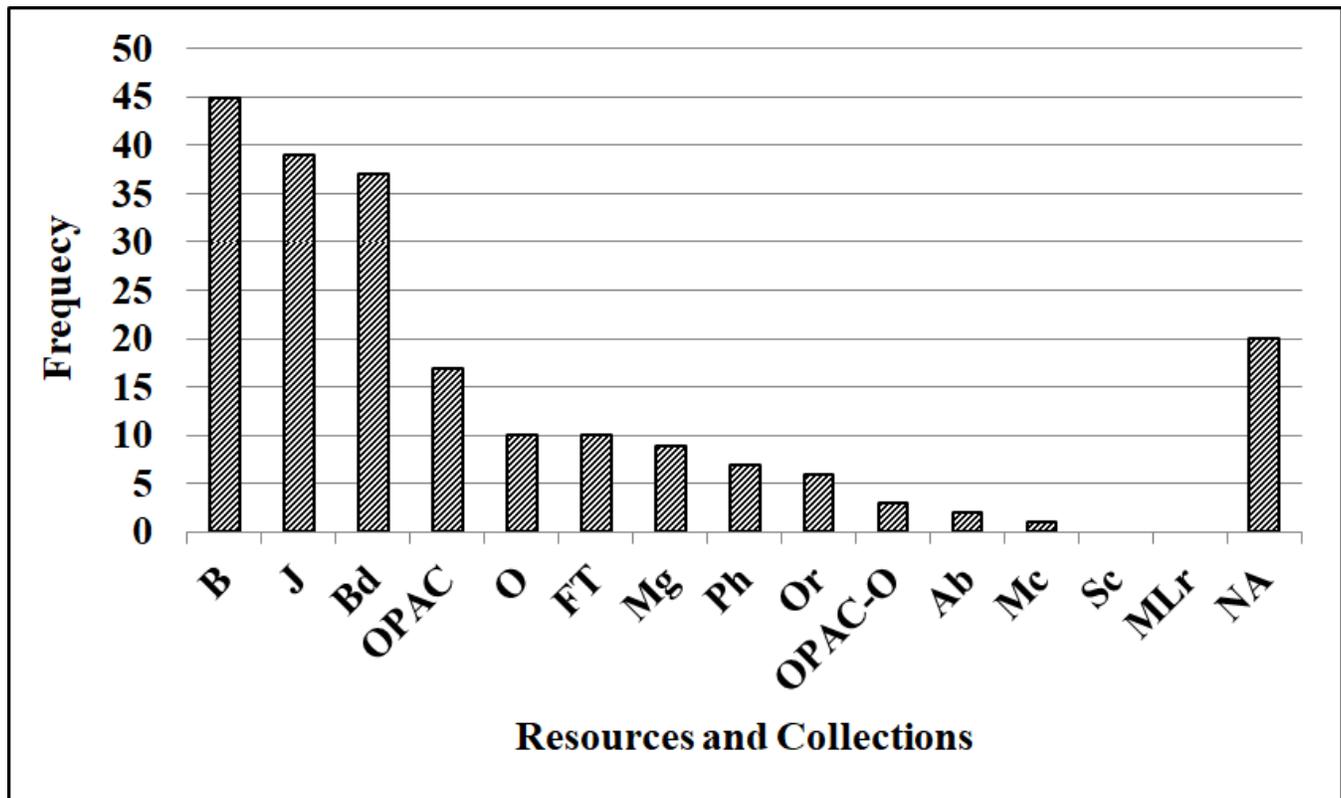


Figure 10. Number of libraries offering resources and collections including B: books; J: journals; Bd: bibliographic databases; OPAC; O: other; FT: full-text databases; Mg: magazines; Ph: physical books; Or: online reference sources; OPAC-O: OPAC of other libraries; Ab: audiobooks; Mc: multimedia collections; Sc: special collection; MLr: multilinguality of resources; NA: not available.

DISCUSSION AND ANALYSIS

The study of websites of the 82 libraries of Pakistan reveals that the majority are not technically sound and cannot assist and offer services to its users, including people with visual or physical impairments. The key observations made in the previous section emphasize the need for the libraries of Pakistan to transform their libraries’ practices from manual to automatic and web-based services. This can be achieved through collaborative research and development efforts from several domains, including computer science, LIS, human-computer interaction, AI, the Semantic Web, and LOD.

There are several examples of library consortia that enable collaborative efforts to make available and accessible catalogs, websites, and activities from a single platform.¹¹³ These include the Online

Computer Library Center (OCLC), the International Coalition of Library Consortia (ICOLC), HathiTrust Digital Library, the arXiv e-Print Archive, Google Books, and shared print storage.¹¹⁴ In Pakistan, PASTIC made the first effort to develop such a consortium¹¹⁵ to allow access to the holdings of the libraries of Pakistan by combining their OPACs. It offers a searchable database of the collections and enables resource sharing among all the member libraries.¹¹⁶ However, its successful implementation in Pakistan requires the willingness of data sharing, professional interaction, and benefiting from the modern technologies among all the libraries of Pakistan. The consortium should be supported with the best practices from information retrieval and semantic web technologies to offer better search and retrieval functionalities.

Users should be made part of the resource description so that the idea of social semantic cataloging¹¹⁷ can be realized, where users can discuss their information needs, recommend books and resources, and enrich the catalog with user-generated content. The artificial intelligence and deep learning algorithms should be exploited in book recommendations so that the available professional metadata and user-generated content could be used to the fullest in serving the users' information needs. The resulting rich metadata should be made available and consumable on the LOD to benefit other potential applications. This will enable the libraries to meet the complex information needs of the users, who describe them in natural language. The natural language is ambiguous, and resources described through user-generated content produced by users in the same language will better support the search and recommendation of books.¹¹⁸ This will improve the resource description, discovery, and access services of the libraries of Pakistan to a greater extent.

Figure 3 depicts another significant limitation of the websites of the libraries of Pakistan: extremely limited availability of navigational, retrieval, and visualization aids for people with visual impairments. Most of the libraries' websites have no provision for accessibility mechanisms. This is unfortunate as in 2017 it was reported that 21.78 million people were affected by blindness and vision impairment.¹¹⁹ Although several technological aids have been defined for performing daily life activities, including navigation, orientation, localization, obstacle detection, etc.,¹²⁰ the libraries of Pakistan, in the majority, lack accessibility-related solutions for those who are blind or have a visual impairment. Holdings should be enriched with audio and braille books and supplemented with an ICT-based accessibility solution. The library building should accommodate visitors with diverse needs. Information about accessibility should be shared as part of the general information on the library's website. In this regard, all the stakeholders of the libraries, including government and non-government organizations, educational institutions, and LIS professionals, should be made involved to work collaboratively on an effective accessibility solution for all library users.¹²¹

Smartphones have been among the top trends in Pakistan, especially for college and university students who use them most frequently. According to the infographic by Grappetite, 77% of smartphone users are between 21 and 30, and 12% are aged 31 to 40 years.¹²² By closely looking at these statistics, people of these two age groups are the most potential users of libraries as they usually need a variety of books. According to Statista, smartphone ownership in Pakistan has increased from 10% in 2014 to 51% in 2020.¹²³ According to Pakistan Telecommunication Authority, currently there are 191 million cellular/mobile phone subscribers, and there are 110 million 3G/4G subscribers.¹²⁴ These statistics suggest that libraries should also benefit from

incorporating smartphones. The most prominent opportunities are developing smartphone apps that support users in knowing about the collection of a library via the Web and producing an interactive user interface that helps them find answers to several of their questions regarding library services. The library OPACs can be made usable and accessible through mobile web applications. There are several prospects and opportunities regarding using library space for people with disabilities through smartphones. A smartphone application can be developed to enable readers in navigation, localization, and finding items of interest in the library.

CONCLUSIONS

This study aims to provide a holistic view of the current state of libraries in Pakistan in the light of the most relevant and recent research works from LIS professionals and researchers. It also attempts to identify some of the major challenges, issues, and research opportunities regarding the current state of LIS practices in libraries of Pakistan with that of technologically advanced countries. The study suggests a need for increasing technology proficiency, adaptability of the latest technologies, proper legislation for LIS practices that meet international standards, improvements in collection development, and efforts to meet library users' needs. The libraries of Pakistan need a transition from traditional and limited solutions to a more advanced, ICT-enabled, user-friendly, and state-of-the-art system to produce a dynamic, consumable, and sharable knowledge space. The libraries must adopt a social semantic cataloging environment to bring all stakeholders to a single platform. Development of a library consortium is critical to connect our local, multilingual, and multicultural collections to users for improved knowledge production, recording, sharing, acquisition, and dissemination. We hope that LIS professionals of Pakistan and the rest of the world, in general, find this article supportive to their current and future studies.

APPENDIX A: DETAILS OF LIBRARIES

Table A-1. The comparison and evaluation of libraries using the criteria in table 1.

S. no.	Library name	URL	Library website design						General information	Web 2.0 tools	Web-based library services			Resources / collections	Instructional tools	Accessibility guidelines	HEC DL access
			Lc	Pc	Sp	Ls	Rwd	MLw			Search	Browse	Other				
1.	Central Library University of Peshawar	http://www.uop.edu.pk/Library/	✓	✓	✗	✗	✗	✗	C, G, Ne, Cn	NA	NA	NA	NA	Ph	NA	✗	✓
2.	Brains Institute Peshawar	http://www.brains.edu.pk/library-2/	✓	✓	✗	✗	✗	✗	Mp	FB, T, I	NA	NA	NA	Ph	NA	✗	✓
3.	Library of Edwardes College, The Mall Peshawar Cantt	https://www.edwardes.edu.pk/library	✓	✓	✗	✗	✗	✗	C, Oh	NA	NA	NA	NA	NA	NA	✗	✓
4.	The Aga Khan University Library	https://www.aku.edu/library/Pages/home.aspx	✓	✓	✗	✓	✓	✗	C, Rs, G, Ne, Cn, FAQ, Lu, Mp, Cl, Vt, P, Wc, Oh	FB, T, I, Yt	ke, as	ca, ke	NA	Ph, O	NA	✗	✓
5.	Air University Central Library	https://www.au.edu.pk/Pages/Library/about_Library.aspx	✓	✓	✗	✓	✓	✗	C, Rs, G, Ne, Cn, FAQ, Lu, Mp, Cl, Vt, P, Wc, Oh	FB, T	ke, tt, su, as	ca	NA	Ph, B, Bd, J	NA	✗	✓
6.	The Allama Iqbal Open University (AIOU)	http://library.aiou.edu.pk/	✓	✓	✗	✓	✓	✗	C, Rs, G, Ne, Cn, FAQ, Lu, Oh, Wc	NA	ke, tt, su, as	ca	NA	Ph, B, Bd, J	NA	✗	✓
7.	Bahria University Libraries	https://bahria.edu.pk/libraries/	✓	✓	✗	✓	✓	✗	C, Rs, G, Ne, Cn, P, Oh	FB, T, I, Fr	ke, tt, su, as	ca	NA	Ph, B, Bd, J	NA	✗	✓

S. no.	Library name	URL	Library website design						General information	Web 2.0 tools	Web-based library services			Resources / collections	Instructional tools	Accessibility guidelines	HEC DL access
			Lc	Pc	Sp	Ls	Rwd	MLw			Search	Browse	Other				
8.	Library of Balochistan University of Engineering & Technology, Khuzdar	http://www.buetk.edu.pk/?page_id=7368	✓	✓	✗	✓	✗	✗	G	NA	NA	NA	NA	Ph	NA	✗	✓
9.	Library of Balochistan University of Information Technology, Engineering & Management Sciences (BUITEMS)	https://www.buitms.edu.pk/library/Defaulthecabuitems.aspx	✗	✗	✗	✗	✗	✗	NA	NA	NA	NA	NA	NA	NA	✗	✓
10	Library of Baqai Medical University	https://baqai.edu.pk/Digital-Library.php	✗	✗	✗	✗	✗	✗	NA	NA	NA	NA	NA	NA	NA	✗	✓
11	Library of BARRETT HODGSON UNIVERSITY	https://www.bhu.edu.pk/Home/TierLibraryBuilding	✗	✗	✗	✗	✗	✗	NA	NA	NA	NA	NA	NA	NA	✗	✗
12	Library of Beaconhouse National University	https://www.bnu.edu.pk/bnu/Facilities/Library	✓	✓	✗	✓	✗	✗	G, Oh	NA	NA	NA	NA	NA	NA	✗	✓
13	COMSATS University Junaid	https://ciit.insignails.com/Lib	✓	✓	✗	✓	✓	✓	C, Rs, G, Ne, Cn, FAQ, Lu,	FB, T	at, tt, su, ke,	at, tt, su, ke,	De,	B, O	Ot	✓	✓

S. no.	Library name	URL	Library website design						General information	Web 2.0 tools	Web-based library services			Resources / collections	Instructional tools	Accessibility guidelines	HEC DL access
			Lc	Pc	Sp	Ls	Rwd	MLw			Search	Browse	Other				
	Zaidi Library	rary/Home https://library.comsats.edu.pk/							Oh		as,ss	ca	Al.,				
14	City University of Science and Information Technology	http://cusit.edu.pk/library/	*	*	*	*	*	*	NA	NA	NA	NA	NA	NA	NA	*	✓
15	Library of Fatima Jinnah Women University	https://fjwu.edu.pk/library/	✓	✓	*	*	*	*	Rs, G, Ne, Cn, Lu, Oh, P	FB, T	NA	NA	NA	NA	NA	*	✓
16	Library of Federal Urdu University of Arts, Sciences & Technology	https://fuuast.edu.pk/library/	*	*	*	*	*	*	NA	NA	NA	NA	NA	NA	NA	*	✓
17	Library of Forman Christian College	http://library.fccollege.edu.pk/	✓	✓	*	✓	✓	*	C, Rs, Cn, FAQ, P, Oh, Mp	R, T, FB	at, tt, su, ke, as,ss	at, tt, su, ca	Al, Em, Ln, Aw, Nw, De, Rq, Lx, Fb, Rc, Cs	OPAC, Bd, FT, J, B, Ab, Mg, OPAC-O, Mc	Rg, Sg, tips, InfL, Cg, Ot, Ug, Pg, Wb	*	✓
18	Library of Foundation University,	http://fui.edu.pk/FUI_MAIN_SITE/index.php/campus-	*	*	*	*	*	*	C	NA	NA	NA	NA	NA	NA	*	✓

S. no.	Library name	URL	Library website design						General information	Web 2.0 tools	Web-based library services			Resources / collections	Instructional tools	Accessibility guidelines	HEC DL access
			Lc	Pc	Sp	Ls	Rwd	MLw			Search	Browse	Other				
	Islamabad	life/library															
19	Library of GIFT University	https://www.gift.edu.pk/page/library-overview	✓	✓	✗	✓	✗	✗	C, Rs, G, Ne, Cn, P, Oh	NA	tt, at, su	ke	Ch, Al, Em, Aw, De	OPAC, Bd, FT, J, B, Or	NA	✗	✓
20	Library of Ghulam Ishaq Khan Institute of Engineering Sciences & Technology	http://119.159.235.56:8085/Forms/Default.aspx	✓	✓	✗	✓	✗	✗	C, Oh	NA	at, tt, su	at, tt, su, ca	NA	OPAC, Bd, FT, J, B, Ab	NA	✗	✓
21	Library of Gomal University	http://clib.ddns.net/	✓	✓	✗	✓	✓	✗	P, Wc	NA	ke, at, tt, su, as	ke, at, tt, su	NA	OPAC, Bd, FT, J, B	NA	✗	✓
22	Library of Government College University	http://library.gcu.edu.pk/	✓	✓	✗	✓	✓	✗	C, Rs, G, Ne, Cn, Lu, Mp, P, Oh	NA	at, tt, su, ke, as	at, tt, su, ca	Al, Em, Ln, Rq, Fb	OPAC, Bd, FT, J, B, Or	Rg, Sg, tips, Cg	✗	✓
23	Government College University Faisalabad	https://library.gcu.edu.pk/	✓	✓	✗	✓	✓	✗	G, Cn, P	NA	ke, tt, at, as	su	NA	OPAC, Bd, FT, J	NA	✗	✓
24	Library of Government College for Women University	https://www.gcwus.edu.pk/library/	✓	✓	✗	✓	✓	✗	C, Rs, P, Cn, Oh	NA	as, ke, at, tt, su	ca, ke, at, tt, su	NA	Bd, FT, J	NA	✗	✓
25	Library of	https://www.gre.a	✓	✓	✗	✓	✓	✗	C, Rs, G, Ne,	FB, T, I,	as, at	ca	Em,	B, Bd	Ot, Wb	✓	✗

S. no.	Library name	URL	Library website design						General information	Web 2.0 tools	Web-based library services			Resources / collections	Instructional tools	Accessibility guidelines	HEC DL access
			Lc	Pc	Sp	Ls	Rwd	MLw			Search	Browse	Other				
	Greenwich University	c.uk/it-and-library/library							Cn, FAQ, Lu, Mp, Cl, Vt, P, Wc, Oh	Yt			Ln, De, Rq, Ch, Fb, Sp				
26	Library of HITEC University	http://111.68.98.204/libmax/opac/index.aspx	✓	✓	✗	✓	✓	✗	C, Rs, Cn, FAQ, P, Oh	NA	ke	ke	NA	B, J, OPAC	NA	✗	✓
27	Library of Habib University	https://habib.edu.pk/library/	✓	✓	✗	✓	✓	✗	Oh, C, Rs, Cn,	FB, T, I, Yt	ke	ke	Al, Em, Ln, Aw, Nw, De, Ch	OPAC, J, FT, B, Mg	NA	✗	✓
28	Library of Hamdard University	http://library.hamdard.edu.pk/	✓	✓	✗	✓	✓	✗	C, Rs, Cn, FAQ, P, Oh	R, T, FB	tt, at, su, ke	ca, ke	Al, De	OPAC, Bd, J, B	InfL, Sg	✗	✓
29	Panjab eLibrary	https://elibrary.punjab.gov.pk/	✓	✓	✗	✓	✓	✗	C, Rs, Cn, FAQ, G, Ne, P, Oh, MP	FB, T, Yt	tt, at, su, as	tt, at, su, ca	Fb	OPAC, Bd, Mg, FT, B, J	InfL	✗	✓
30	Library of ILMA University	https://ilmauniversity.edu.pk/digitalibrary	✓	✓	✗	✓	✓	✗	C, Mp	NA	NA	NA	NA	Bd, FT, J, Mg, Or	NA	✗	✓
31	Library of Iqra National University	https://iqra.edu.pk/library/	✓	✓	✗	✓	✓	✗	C, Oh, Cn	NA	NA	NA	NA	NA	NA	✗	✓

S. no.	Library name	URL	Library website design						General information	Web 2.0 tools	Web-based library services			Resources / collections	Instructional tools	Accessibility guidelines	HEC DL access
			Lc	Pc	Sp	Ls	Rwd	MLw			Search	Browse	Other				
32	Library of International Islamic University	https://www.iiu.edu.pk/?page_id=171	✓	✓	✗	✓	✓	✗	C, Ne, Oh, Cn, Rs	FB, T,	at, tt, su	at, tt, su	Fb	O, Bd, OPAC	NA	✗	✓
33	Library of Institute of Space Technology	https://www.ist.edu.pk/library	✗	✗	✗	✗	✗	✗	NA	NA	NA	NA	NA	NA	NA	✗	✓
34	Library of Institute of Southern Punjab	https://isp.edu.pk/LibraryITSupport	✗	✗	✗	✗	✗	✗	NA	NA	NA	NA	NA	NA	NA	✗	✓
35	Library of Islamia University Punjab	http://library.iub.edu.pk/	✓	✓	✗	✓	✓	✗	Oh	NA	at, tt, su, ke, as	at, tt, su, ke, ca	Rc, Em, De	OPAC	NA	✗	✓
36	Library of Isra University	https://isra.edu.pk/library/	✗	✗	✗	✗	✓	✗	NA	NA	tt, su, at, as	tt, su, at, ca	NA	OPAC	NA	✗	✓
37	Library of Jinnah Sindh Medical University	http://www.jsmu.edu.pk/facilities-library.html	✗	✗	✗	✗	✗	✗	NA	NA	NA	NA	NA	NA	NA	✗	✓
38	Library of Khyber Medical University	https://www.kmc.edu.pk/new/library/	✗	✗	✗	✗	✗	✗	NA	NA	NA	NA	NA	NA	NA	✗	✓
39	Library of King Edward Medical University	https://kemu.edu.pk/library	✗	✗	✗	✗	✗	✗	G, Oh	NA	NA	NA	NA	NA	NA	✗	✓
40	Library of Lahore College for	http://www.lcwu.edu.pk/lcwu-	✓	✓	✗	✓	✓	✗	G, Rs, FAQ, P	NA	NA	NA	NA	Bd	NA	✗	✓

S. no.	Library name	URL	Library website design						General information	Web 2.0 tools	Web-based library services			Resources / collections	Instructional tools	Accessibility guidelines	HEC DL access
			Lc	Pc	Sp	Ls	Rwd	MLw			Search	Browse	Other				
	Women University	library-research-websites.html															
41	Library of Lahore University of Management Sciences	https://library.lums.edu.pk/	✓	✓	✗	✓	✓	✗	Ne, Cn, Vt, Oh	FB, I	ke, at, tt	ke, at, tt, su, ca	Al, Ch	Bd, J, B	InfL, tips, Rg	✗	✓
42	Library of Mehran University of Engineering & Technology	http://library.muet.edu.pk/index.php	✓	✓	✗	✓	✓	✗	C, Ne, Cn, Oh	FB, Yt, T, I, R, B	at, tt, su, ke, as	at, tt, su, ca	Al, De, Ln	Bd, J, B, OPAC, Or	InfL, Rg	✗	✓
43	Library of Minhaj University	https://library.muh.edu.pk/	✓	✓	✗	✓	✓	✗	C, Ne, Mp, Rs, Cn, Oh, G	FB, T, Yt	at, tt, su, ke, as	at, tt, su, ca	Ln, De	B, J, Or, Bd,	InfL, Pg, Cg, Rg	✗	✓
44	Library of Mirpur University of Science & Technology	https://cms.must.edu.pk:8083/Forms/Default.aspx	✓	✓	✗	✓	✓	✗	C, Oh, Cn	NA	at, tt, su, as, ke	at, tt, su, ke, ca	NA	B	NA	✗	✓
45	Library of Mohammad Ali Jinnah University	http://ils.jinnah.edu/	✓	✓	✗	✓	✓	✗	C, Oh, Cn	NA	at, tt, su, ke, as	at, tt, su, ca	NA	B, J, Bd	NA	✗	✓
46	Engr. Abul Kalam Library NED University of Engineering & Technology	https://library.neduet.edu.pk/	✓	✓	✗	✓	✓	✗	C, Cn	NA	ke, au, tt	ke, at, tt	NA	B, J, Mg, Bd	Cg	✗	✓
47	Library of Namal	http://library.namal.edu.pk/	✓	✓	✗	✓	✓	✗	Ne, Cn, Oh	NA	at, tt,	at, tt,	NA	J, B, Bd,	NA	✗	✓

S. no.	Library name	URL	Library website design						General information	Web 2.0 tools	Web-based library services			Resources / collections	Instructional tools	Accessibility guidelines	HEC DL access
			Lc	Pc	Sp	Ls	Rwd	MLw			Search	Browse	Other				
	Institute, Mainwali	al.edu.pk/									su, ke, as	su, ca		Mg			
48	Library of National Defense University	http://111.68.99.107/libmax/opac/index.aspx	✓	✓	✗	✓	✓	✗	C, Cn, Oh	NA	ke, as	ke, ca	NA	B, J, Mg	NA	✗	✓
49	Library of National Textile University	http://ntu.edu.pk/library/	✓	✓	✗	✓	✓	✗	Cn, Oh, Ne, FAQ	FB	tt, su, at, as	tt, su, at, ca	NA	B, Bd, J, OPAC	Cg, InfL	✗	✓
50	Library of National University of Sciences & Technology	http://www.nust.edu.pk/Library/Pages/default.aspx	✓	✓	✗	✓	✓	✗	Cn, Mp, C, G, Oh, Vt, FAQ	NA	at, tt, su, ke, as	at, tt, su, ke, ca	NA	B, Bd, J, OPAC	InfL	✗	✓
51	Library of Peoples University of Medical & Health Sciences for Women	http://opac.pumhs.edu.pk/	✓	✓	✗	✓	✓	✗	Cn, Mp, C, G, Oh, Vt, FAQ	NA	at, tt, su, ke, as	at, tt, su, ke, ca	NA	B, Bd, J, OPAC	InfL	✗	✓
52	Library of Shaheed Benazir Bhutto University Sheringal Dir Upper Pakistan	http://142.54.178.188:5229/	✓	✓	✗	✓	✓	✗	NA	NA	at, tt, su, ke, as	at, tt, su, ke, ca	NA	B, Bd, J, OPAC	NA	✗	✓
53	Library of Shaheed Zulfikar Ali Bhutto Institute of Science & Technology	https://szabist.edu.pk/szabist-library/	✓	✗	✗	✓	✓	✗	Cn, Mp, C, G, Oh, Vt, Ne, FAQ, P	NA	ke, as	at, tt, su, ke, ca	Al, Em	B, J	NA	✗	✓

S. no.	Library name	URL	Library website design						General information	Web 2.0 tools	Web-based library services			Resources / collections	Instructional tools	Accessibility guidelines	HEC DL access
			Lc	Pc	Sp	Ls	Rwd	MLw			Search	Browse	Other				
54	Library of Sir Syed Case Institute of Technology	https://case.edu.pk/Library/Default.aspx	✓	✓	✗	✓	✓	✗	Oh, Cn	FB, T	tt, at, ke, su, as	tt, ca	NA	B, O	NA	✗	✓
55	Library of The Islamia College, Peshawar	http://142.54.178.188:5209	✓	✓	✗	✓	✓	✗	NA	NA	NA	NA	NA	NA	NA	✗	✓
56	Library of University of Balochistan	http://web.uob.edu.pk/uob/departments/Library/Library.php	✓	✓	✗	✓	✓	✗	Cn, Mp, C	NA	ke	ke	NA	B	NA	✗	✓
57	Library of The University of Agriculture Peshawar	http://www.aup.edu.pk/library.php	✗	✗	✗	✗	✗	✗	NA	NA	NA	NA	NA	NA	NA	✗	✓
58	Library of University of Buner	https://www.ubuner.edu.pk/library	✓	✗	✗	✗	✗	✗	Oh, G, C	NA	NA	NA	NA	NA	NA	✗	✗
59	Library of University of Central Punjab	http://library.ucp.edu.pk/	✓	✓	✗	✓	✓	✗	Oh, G, C, Rs, Ne, Cn, Mp, Vt	FB	tt, at, as	tt, at, ca	NA	B, Mg, J, Bd	Cg, InfL	✗	✓
60	Library of University of Engineering & Technology Khyber Pakhtunkhwa	https://www.uetpeshawar.edu.pk/library.php	✓	✗	✗	✗	✗	✗	NA	NA	NA	NA	NA	NA	NA	✗	✓

S. no.	Library name	URL	Library website design						General information	Web 2.0 tools	Web-based library services			Resources / collections	Instructional tools	Accessibility guidelines	HEC DL access
			Lc	Pc	Sp	Ls	Rwd	MLw			Search	Browse	Other				
61	Library of University of Engineering Technology Lahore	http://library.uet.edu.pk/	✓	✓	✗	✓	✓	✗	NA	R	at, tt, su, ke, as	ke, ca, at, tt	Al	B, J, Bd	NA	✗	✓
62	Library of University of Engineering & Technology, Taxila	https://www.uettaxila.edu.pk/library.aspx	✓	✓	✗	✓	✓	✗	Cn, Rs, Ne, Oh, C	T	at, tt, su, ke, as	at, tt, su, ke, ca	Al	B, Bd, J	NA	✗	✓
63	Library of University of Haripur	http://www.uoh.edu.pk/central-library.php?page=MjYx	✓	✓	✗	✓	✓	✗	Cn, Rs, Ne, Oh, C	NA	ke	at, tt, su, ke, ca	NA	B, Bd, J, O	NA	✗	✓
64	Library of University of Karachi	http://www.uok.edu.pk/library/index.php	✓	✓	✗	✓	✓	✗	Cn, Rs, Ne, Oh, C, Mp	NA	ke	at, tt, su, ke, ca	NA	B, Bd, J, O	NA	✗	✓
65	Library of University of Management & Technology	https://library.umt.edu.pk/Home.aspx	✓	✓	✗	✓	✓	✗	Cn, Rs, Ne, Oh, C, Mp	FB, T	at, tt, su, ke, as	at, tt, su, ke, ca	Al, Em	B, Bd, J	NA	✗	✓
66	Online catalogue, Central library, University of Sargodha	http://142.54.178.188:5157/	✓	✓	✗	✓	✓	✗	NA	NA	at, tt, su, ke, as	at, tt, su, ke, ca	NA	B, Bd, J	NA	✗	✓
67	Library of University of	https://library.usa.edu.pk/	✓	✓	✗	✓	✓	✗	Cn, Rs, Lu, Oh, C	NA	at, tt, su, ke,	at, tt, su, ke,	Al, Rq	B, Bd, J	NA	✗	✓

S. no.	Library name	URL	Library website design						General information	Web 2.0 tools	Web-based library services			Resources / collections	Instructional tools	Accessibility guidelines	HEC DL access
			Lc	Pc	Sp	Ls	Rwd	MLw			Search	Browse	Other				
	South Asia										as	ca					
68	Library of University of the Punjab	https://pulibrary.edu.pk/	✓	✓	✗	✓	✓	✗	Cn, Rs, Oh, C	FB	tt, at, as, ke	tt, ca	Al, Ch, Em	Bd, B, J, O, OPAC-O	Rg, Sg, Cg	✗	✓
69	Library of Zia-ud-Din University	https://zu.edu.pk/academics/library/	✓	✓	✗	✓	✓	✗	Cn, Rs, Oh, C, G, Ne, P, Lu	NA	at, tt, su, ke, as	at, tt, su, ke, ca	NA	Bd, J, OPAC-O	NA	✗	✓
70	Library of Cabinet Division, Islamabad	http://ndw.gov.pk/index.html	✓	✓	✗	✓	✓	✗	Cn, Rs, Oh, C, FAQ, G, Ne, P, Lu	NA	NA	NA	NA	NA	NA	✗	✗
71	eLibrary, Government of The Punjab	https://elibrary.punjab.gov.pk/	✓	✓	✗	✓	✓	✗	Mp	FB, T, Yt	at, tt, su, ke, as	at, tt, su, ke, ca	NA	Bd, B, J, O, OPAC-O	NA	✗	✗
72	HEC digital library	http://hec.pk.summon.serialssolutions.com/	✓	✓	✗	✓	✓	✗	NA	NA	ke, as	at, su, ca	NA	B, O, J, Mg	NA	✗	✓
73	Bahauddin Zakariya University (BZU), Multan	http://library.bzu.edu.pk	✓	✓	✗	✓	✓	✗	NA	NA	NA	NA	NA	B, J	NA	✗	✓
74	Begum Nustrat Bhutto Women University, Sukkur	http://143.244.157.171	✓	✓	✗	✓	✗	✗	NA	FB, I	OPAC, at, tt, su, ke, as	at, tt, su, ke, ca	NA	B, J	NA	✗	✓
75	CECOS University of Information	http://sites.google.com/view/library	✓	✓	✗	✓	✗	✗	Lu, Cn, Oh	NA	OPAC,	at, tt	NA	B	NA	✗	✓

S. no.	Library name	URL	Library website design						General information	Web 2.0 tools	Web-based library services			Resources / collections	Instructional tools	Accessibility guidelines	HEC DL access
			Lc	Pc	Sp	Ls	Rwd	MLw			Search	Browse	Other				
	Technology & Emerging Sciences	cup/home									at, tt						
76	DHA Suffa University	http://dclkarachi.com	✓	✓	✗	✓	✓	✗	C, Cn, Mp	FB, T	tt, at, su, ke	tt, at, su, ke	NA	B	NA	✗	✓
77	Institute of Business Management	https://iobm.daphnis.opalsinfo.net/bin/home	✓	✓	✗	✓	✓	✗	C, Cn, Lu	R	OPAC, at, tt, ke, as, su	ca, at, tt, su	NA	B	NA	✗	✓
78	Jinnah University for Women	https://www.juw.edu.pk/campus-facilities/library-1/	✓	✓	✗	✓	✗	✗	C, Cn	NA	NA	NA	NA	NA	NA	✗	✓
79	Khawaja Freed University of Engineering & Information Technology, Rahim Yar Khan	https://kfueit.edu.pk/about-library?1=1&menu=side-link?main=840&main=859&parent=Facilities	✓	✓	✗	✓	✗	✗	C, Cn, Oh	FB, T, Yt	NA	NA	NA	NA	NA	✗	✓
80	Kinnaird College for Women, Lahore	http://www.kinnaird.edu.pk/library-3/	✓	✓	✗	✓	✗	✗	Cn, FAQ	NA	NA	NA	NA	Or	NA	✗	✗
81	Lahore Leads University	https://leads.edu.pk/Libraries-.php	✓	✓	✗	✓	✗	✗	Cn, C	FB, T	OPAC, at, tt, ke, as, su	ca, at, tt, su	NA	B	NA	✗	✓
82	Minhaj University	https://lrc.mul.ed	✓	✓	✗	✓	✓	✗	C, Cn, Mp	FB, T, Yt	OPAC,	su, ca	NA	B	NA	✗	✓

S. no.	Library name	URL	Library website design						General information	Web 2.0 tools	Web-based library services			Resources / collections	Instructional tools	Accessibility guidelines	HEC DL access
			Lc	Pc	Sp	Ls	Rwd	MLw			Search	Browse	Other				
		u.pk/								ke							

ENDNOTES

- ¹ Younghee Noh and Rosa Chang, "International Collaboration in Library and Information Science Research in Korea," *International Journal of Knowledge Content Development & Technology* 9, no. 2 (2019):91–110, <https://doi.org/10.5865/IJKCT.2019.9.2.091>; Muhammad Abbas Ganaee and Muhammad Rafiq, "Pakistani University Library Web Sites: Features, Contents, and Maintenance Issues," *Journal of Web Librarianship* 10, no. 4 (2016): 294–315, <https://doi.org/10.1080/19322909.2016.1195308>.
- ² Noh and Chang, "International Collaboration in Korea," 95.
- ³ Ganaee and Rafiq, "Pakistani University Library Web Sites," 294.
- ⁴ In this study, we evaluated the websites of the libraries of public and private sector universities and research institutes. These websites are listed on the digital library website of HEC, Pakistan, available at <http://www.digitallibrary.edu.pk/institutes.php>.
- ⁵ Alessandro Liberati et al., "The PRISMA Statement for Reporting Systematic Reviews and Meta-Analyses of Studies that Evaluate Health Care Interventions: Explanation and Elaboration," *Journal of Clinical Epidemiology* 6, no. 7 (2009): e1–e34, <https://doi.org/10.1016/j.jclinepi.2009.06.006>.
- ⁶ Michael Gusenbauer, "Google Scholar to Overshadow Them All? Comparing the Sizes of 12 Academic Search Engines and Bibliographic Databases," *Scientometrics* 118, no. 1 (2019):177–214, <https://doi.org/10.1007/s11192-018-2958-5>.
- ⁷ Liberati et al., "PRISMA," e9.
- ⁸ Liberati et al., "PRISMA," e1.
- ⁹ Liberati et al., "PRISMA," e5.
- ¹⁰ Irfan Ullah and Shah Khusro, "Social Book Search: The Impact of the Social Web on Book Retrieval and Recommendation," *Multimedia Tools and Applications* 79, no. 11 (2020): 8011–60, <https://doi.org/10.1007/s11042-019-08591-0>; Liberati et al., "PRISMA," e9–e10.
- ¹¹ Liberati et al., "PRISMA," e5.
- ¹² Charlene L. Al-Qallaf and Alaa Ridha, "A Comprehensive Analysis of Academic Library Websites: Design, Navigation, Content, Services, and Web 2.0 Tools," *International Information & Library Review* 51, no. 2 (2019): 93–106, <https://doi.org/10.1080/10572317.2018.1467166>; Rozalynd P. McConnaughy and Steven P. Wilson, "Content and Design Features of Academic Health Sciences Libraries' Home Pages," *Medical Reference Services Quarterly* 37, no. 2 (2018): 153–67, <https://doi.org/10.1080/02763869.2018.1439219>; Gricel Dominguez, Sarah J. Hammill, and Ava Iuliano Brillat, "Toward a Usable Academic Library Web Site: A Case Study of Tried and Tested Usability Practices," *Journal of Web Librarianship* 9, no. 2–3 (2015): 99–120, <https://doi.org/10.1080/19322909.2015.1076710>.

- ¹³ Al-Qallaf and Ridha, "Web 2.0 Tools," 100; McConnaughy and Wilson, "Libraries' Home Pages," 166–67; Anna Mierzecka and Andrius Suminas, "Academic Library Website Functions in the Context of Users' Information Needs," *Journal of Librarianship and Information Science* 50, no. 2 (2018): 157–67, <https://doi.org/10.1177/0961000616664401>; Alan Kerr and Diane Rasmussen Pennington, "Public Library Mobile Apps in Scotland: Views from the Local Authorities and the Public," *Library Hi Tech* 36, no. 2 (2018): 237–51, <https://doi.org/10.1108/LHT-05-2017-0091>; Saleeq Ahmad Dar, "Mobile Library Initiatives: A New Way to Revitalize the Academic Library Settings," *Library Hi Tech News* 36, no. 5 (2019): 15–21, <https://doi.org/10.1108/LHTN-05-2019-0032>.
- ¹⁴ Al-Qallaf and Ridha, "Web 2.0 Tools," 102; McConnaughy and Wilson, "Libraries' Home Pages," 159.
- ¹⁵ Al-Qallaf and Ridha, "Web 2.0 Tools," 95–97; Irfan Ullah and Shah Khusro, "On the Search Behaviour of Users in the Context of Interactive Social Book Search," *Behaviour & Information Technology* 39, no. 4 (2020): 443–62, <https://doi.org/10.1080/0144929X.2019.1599069>; McConnaughy and Wilson, "Libraries' Home Pages," 153–67; Mierzecka and Suminas, "Website Functions," 164; Kerr and Pennington, "Scotland," 243; Dar, "Mobile Library Initiatives," 15–17.
- ¹⁶ Al-Qallaf and Ridha, "Web 2.0 Tools," 100; McConnaughy and Wilson, "Libraries' Home Pages" 153–67; Mierzecka and Suminas, "Website Functions," 162–64; Kerr and Pennington, "Scotland," 243.
- ¹⁷ Al-Qallaf and Ridha, "Web 2.0 Tools," 95–100; McConnaughy and Wilson, "Libraries' Home Pages," 158; Mierzecka and Suminas, "Website Functions," 161, 162; Dar, "Mobile Library Initiatives," 19.
- ¹⁸ Mierzecka and Suminas, "Website Functions," 158; Paul Khawaja, "A Software Tool-Based Accessibility Assessment of Public Library Websites in the United States," (masters paper, University of North Carolina, Chapel Hill, (2020): 1–51, <https://doi.org/10.17615/432g-f412>; Rita Kosztyánné Mátrai, "How to Make an Electronic Library Accessible," *The Electronic Library* 36, no. 4 (2018): 620–32, <https://doi.org/10.1108/EL-07-2017-0143>.
- ¹⁹ Muhammad Rafi, Ghalib Khan, and Sikandar Ali, "Challenges Associated with Resource Selection in Public Libraries of Khyber Pakhtunkhawa, Pakistan," *Information and Knowledge Management* 6, no. 2 (2016): 27–33, <https://www.iiste.org/Journals/index.php/IKM/article/view/28709>.
- ²⁰ Ghalib Khan and Rubina Bhatti, "Collection Development and Management in the University Libraries of Pakistan: A Survey of Users' Satisfaction," *International Information & Library Review*, 53, no. 3 (2021): 239–53, <https://doi.org/10.1080/10572317.2020.1830739>; Muhammad Rafi, Sikandar Ali, and Ashfaq Ahmad, "Administrative Challenges to Public Libraries in Khyber Pakhtunkhawa Pakistan: An Empirical Study," *Journal of Studies in Social Sciences* 15, no. 1 (2016): 32–48, <https://infinitypress.info/index.php/jsss/article/view/1280>.
- ²¹ Khan and Bhatti, "Collection Development," 248; Rafi, Ali, and Ahmad, "Khyber Pakhtunkhawa," 36.

- ²² Amjid Khan, Rubina Bhatti, Ghalib Khan, and Muhammad Ismail, "The Role of Academic Libraries in Facilitating Undergraduate and Post-Graduate Studies: A Case Study of the University of Peshawar, Pakistan," *Chinese Librarianship: An International Electronic Journal* 2014, no. 38 (2014): 36–49, <http://white-clouds.com/iclc/cliej/cl38KBKI.pdf>; Atta Ur-Rehman Marwat and Muhammad Younus, "Evaluation of College Libraries in Khyber Pakhtunkhwa, Pakistan: Condition, Role, and Challenges," *Library Philosophy and Practice* 2020, no. 4049 (2020): 1–43, <https://digitalcommons.unl.edu/libphilprac/4049>.
- ²³ Muhammad Naeem and Nadeem Siddique, "Use of Print and Electronic Journals by the Academic Community: A Survey at GC University Lahore," *Library Philosophy and Practice* 2020, no. 3788 (2020): 1–16, <https://digitalcommons.unl.edu/libphilprac/3788>; Muhammad Abbas Ganaee, "Library Websites of Pakistani Universities: An Exploratory Study," *Qualitative and Quantitative Methods in Libraries* 5, no. 2 (2017): 385–95, <http://www.qqml.net/index.php/qqml/article/view/325>; Alia Arshad and Kanwal Ameen, "Academic Scientists' Scholarly Use of Information Resources in the Digital Environment: Perceptions and Barriers," *Global Knowledge, Memory and Communication* 67, no. 6/7 (2018): 467–83, <https://doi.org/10.1108/GKMC-05-2018-0044>.
- ²⁴ Khan et al., "Facilitating," 36, 45.
- ²⁵ Muhammad Rafiq, Kanwal Ameen, and Munazza Jabeen, "Barriers to Digitization in University Libraries of Pakistan: A Developing Country's Perspective," *The Electronic Library* 36, no. 3 (2018): 457–70, <https://doi.org/10.1108/EL-01-2017-0012>; Marwat and Younus, "College Libraries," 24; Nadeem Siddique and Khalid Mahmood, "Status of Library Software in Higher Education Institutions of Pakistan," *International Information & Library Review* 47, no. 3–4 (2015): 59–65, <https://doi.org/10.1080/10572317.2015.1087796>.
- ²⁶ Muhammad Rafiq and Kanwal Ameen, "Towards a Digitization Framework: Pakistani Perspective," *Pakistan Journal of Information Management & Libraries* 15, no. 1 (2014): 22–29, <http://journals.pu.edu.pk/journals/index.php/pjiml/article/view/757>; Khan and Bhatti, "Collection Development," 241; Marwat and Younus, "College Libraries," 37.
- ²⁷ Rafiq, Ameen, and Jabeen, "Barriers," 459, 465; Khan and Bhatti, "Collection Development," 252.
- ²⁸ Khan and Bhatti, "Collection Development," 247.
- ²⁹ Khan et al., "Facilitating," 46;
- ³⁰ Khan and Bhatti, "Collection Development," 240.
- ³¹ Khan and Bhatti, "Collection Development," 240, 247.
- ³² Nosheen Fatima Warraich and Abebe Rorissa, "Adoption of Linked Data Technologies among University Librarians in Pakistan: Challenges and Prospects," *Malaysian Journal of Library & Information Science* 23, no. 3 (2018): 1–13, <https://doi.org/10.22452/mjlis.vol23no3.1>.

- ³³ Nazia Wahid Nosheen, Fatima Warraich and Muzammil Tahira, "Mapping the Cataloguing Practices in Information Environment: A Review of Linked Data Challenges," *Information and Learning Science* 119, no. 9/10 (2018): 586–96, <https://doi.org/10.1108/ILS-10-2017-0106>.
- ³⁴ Haseeb Ahmad Piracha and Kanwal Ameen, "Policy and Planning of Research Data Management in University Libraries of Pakistan," *Collection and Curation* 38, no. 2 (2019): 39–44, <https://doi.org/10.1108/CC-08-2018-0019>; Amjid Khan and Shamsahd Ahmed, "Usage of E-Databases and E-Journals by Research Community in Pakistani Universities: Issues and Perspectives," *Library Philosophy and Practice*, 2020, no. 4570 (2020): 1–11, <https://digitalcommons.unl.edu/libphilprac/4570>.
- ³⁵ Muhammad Rafi, Zheng JianMing, and Khurshid Ahmad, "Evaluating the Impact of Digital Library Database Resources on the Productivity of Academic Research," *Information Discovery and Delivery* 47, no. 1 (2019): 42–52, <https://doi.org/10.1108/IDD-07-2018-0025>; Asif Altaf and Nosheen Fatima Warraich, "Awareness and Use of Electronic Information Sources by University Students in Pakistan," *Pakistan Library & Information Science Journal* 48, no. 4 (2017): 14–25, <https://www.researchgate.net/publication/326356264>.
- ³⁶ Muhammad Naeem and Mohammad Javid Khan, "Do Social Networking Applications Support the Antecedents of Knowledge Sharing Practices?" *VINE Journal of Information and Knowledge Management Systems* 49, no. 4 (2019): 494–509, <https://doi.org/10.1108/VJIKMS-12-2018-0133>.
- ³⁷ Amjid Khan, Shamshad Ahmed, Asad Khan, and Ghalib Khan, "The Impact of Digital Library Resources Usage on Engineering Research Productivity: An Empirical Evidence from Pakistan," *Collection Building* 36, no. 2 (2017): 37–44, <https://doi.org/10.1108/CB-10-2016-0027>; Ikram Ul Haq and Rabiya Ali Faridi, "Knowledge Sharing Practices amongst the Library and Information Professionals of Pakistan in the Digital Era," in *Cooperation and Collaboration Initiatives for Libraries and Related Institutions*, ed. Colleen Takaingenhamo Chisita (Hershey, PA: IGI Global, 2020) 200–17, <https://doi.org/10.4018/978-1-7998-0043-9.ch010>.
- ³⁸ Warraich and Rorissa, "Adoption," 7, 8, 13.
- ³⁹ Khan and Bhatti, "Collection Development," 248; Rafi, Ali, and Ahmad, "Khyber Pakhtunkhwa," 42; Siddique and Mahmood, "Library Software," 64.
- ⁴⁰ Rafiq, Ameen, and Jabeen, "Barriers," 464, 465, 467; Sajjad Ahmad, Shehzad Ahmad, and Muhammad Kamran, "Electronic Information Resource Sharing among the Research Scholars: A Case of University of Peshawar," *Pakistan Library & Information Science Journal* 50, no. 2 (2019): 45–60.
- ⁴¹ Mirza Abdul Rasheed and Muhammad Rafiq, "New Trends and Practices for Digital Reference Service (DRS) A Survey in the University Libraries of Punjab, Pakistan," *Pakistan Library & Information Science Journal* 48, no. 4 (2017): 44–55; Saira Hanif Soroya and Kanwal Ameen, "What Do They Want? Millennials and Role of Libraries in Pakistan," *The Journal of Academic Librarianship* 44, no. 2 (2018): 248–55, <https://doi.org/10.1016/j.acalib.2018.01.003>.

- ⁴²Rubia Khan, Arif Khan, Sidra Malik, and Haroon Idrees, "Virtual Reference Services through Web Search Engines: Study of Academic Libraries in Pakistan," *Publications* 5, no. 2 (2017): 1–13, <https://doi.org/10.3390/publications5020006>.
- ⁴³Hafiz Habib-ur-Rehman, Haroon Idrees, and Ahsan Ullah, "Organization and Usage of Information Resources at Deeni Madaris Libraries in Pakistan," *Library Review* 66, no. 3 (2017): 163–78, <https://doi.org/10.1108/LR-02-2016-0016>; Nadeem Siddique and Khalid Mahmood, "Library Software in Pakistan: A Review of Literature," *Library Review* 63, no. 3 (2014): 224–40, <https://doi.org/10.1108/LR-04-2013-0048>.
- ⁴⁴Khurshid Ahmad, Zheng JianMing, and Muhammad Rafi, "An Analysis of Academic Librarians Competencies and Skills for Implementation of Big Data Analytics in Libraries," *Data Technologies and Applications* 53, no. 2 (2019): 201–16, <https://doi.org/10.1108/DTA-09-2018-0085>.
- ⁴⁵Shahzad Abbas, Shanawar Khalid, and Fakhar Abbas Hashmi, "Library Websites as Source of Marketing of Library Resources: An Empirical Study of HEC Recognized Universities of Pakistan," *Qualitative and Quantitative Methods in Libraries* 5, no. 1 (2017): 235–49, <http://www.qqml.net/index.php/qqml/article/view/321>; Rubina Bhatti, Awais Asghar, and Amjid Khan, "The Websites in University Libraries of Pakistan: Current Status and New Perspectives," *Pakistan Library & Information Science Journal* 46, no. 1 (2015): 26–35.
- ⁴⁶Ganaee and Rafiq, "Pakistani University Library Web Sites," 294, 303–9.
- ⁴⁷Ganaee, "Library Websites," 385.
- ⁴⁸Warraich and Rorissa, "Linked Data Technologies," 7–9.
- ⁴⁹Asim Ullah, Shah Khusro, and Irfan Ullah, "Bibliographic Classification in the Digital Age: Current Trends & Future Directions," *Information Technology and Libraries* 36, no. 3 (2017): 48–77, <https://doi.org/10.6017/ital.v36i3.8930>.
- ⁵⁰Muhammad Ss Mirza, and Muhammad Arif, "Challenges in Information Technology Adoption in Pakistani University Libraries," *International Journal of Knowledge Content Development & Technology* 6, no. 1 (2016): 105–16, <https://doi.org/10.5865/IJKCT.2016.6.1.105>.
- ⁵¹Khan et al., "Virtual Reference Services," 4–8.
- ⁵²Wahid, Warraich, and Tahira, "Mapping," 587, 593.
- ⁵³Nosheen Fatima Warraich, "Linked Data Technologies in Libraries: An Appraisal," *Journal of Political Studies* 23, no. 2 (2016): 697–707.
- ⁵⁴Corine Deliot, "Publishing the British National Bibliography as Linked Open Data," *Catalogue & Index*, no. 174 (March 2014): 13–18, [https://cdn.ymaws.com/www.cilip.org.uk/resource/collection/F71F19C3-49CF-462D-8165-B07967EE07F0/Catalogue and Index issue 174, March 2014.pdf](https://cdn.ymaws.com/www.cilip.org.uk/resource/collection/F71F19C3-49CF-462D-8165-B07967EE07F0/Catalogue%20and%20Index%20issue%20174,%20March%202014.pdf).

- ⁵⁵ Muhammad Rafi et al., "Knowledge-Based Society and Emerging Disciplines: A Correlation of Academic Performance," *The Bottom Line* 33, no. 4 (2020): 337–58, <https://doi.org/10.1108/BL-12-2019-0130>.
- ⁵⁶ Ali Mansouri and Nooshin Soleymani Asl, "Assessing Mobile Application Components in Providing Library Services," *The Electronic Library* 37, no. 1 (2019): 49–66, <https://doi.org/10.1108/EL-10-2018-0204>.
- ⁵⁷ Hamaad Rafique et al., "Do Digital Students Show an Inclination toward Continuous Use of Academic Library Applications? A Case Study," *The Journal of Academic Librarianship* 47, no. 2 (2020): 1–15, <https://doi.org/10.1016/j.acalib.2020.102298>.
- ⁵⁸ Ganaee and Rafiq, "Pakistani University Library Web Sites," 303–10.
- ⁵⁹ Asad Khan, "Investigating the Factors Influencing Librarians' Intention toward the Adoption of Koha—An Open Source Integrated Library System in Pakistan," *Library Philosophy and Practice* 2020, no. 4360 (2020): 1–52: <https://digitalcommons.unl.edu/libphilprac/4360>.
- ⁶⁰ Arslan Sheikh, "Evaluating the Usability of COMSATS Institute of Information Technology Library Website: A Case Study," *The Electronic Library* 35, no. 1 (2017): 121–36, <https://doi.org/10.1108/EL-08-2015-0149>.
- ⁶¹ Khan and Ahmed, "Research Community," 2, 3.
- ⁶² Arif Khan, Haroon Idrees, and Khan Mudassir, "Library Web Sites for People with Disability: Accessibility Evaluation of Library Websites in Pakistan," *Library Hi Tech News* 32, no. 6 (2015): 1–7, <https://doi.org/10.1108/LHTN-01-2015-0010>.
- ⁶³ Muhammad Tariq and Khalid Mahmood, "Use, Purpose and Usage Ranking of Online Information Resources by University Research Students," *2015 4th International Symposium on Emerging Trends and Technologies in Libraries and Information Services, Noida, India* (2015): 257–63, <https://doi.org/10.1109/ETTLIS.2015.7048208>.
- ⁶⁴ "Online Book Search," Pakistan Scientific and Technological Information Center (PASTIC), accessed March 24, 2022, <http://pastic.gov.pk/advancebooksearch.aspx>.
- ⁶⁵ "Objectives," Pakistan Scientific and Technological Information Center (PASTIC), accessed March 22, 2022, <http://pastic.gov.pk/objectives.aspx?par=abtp&cmenu=objectives>.
- ⁶⁶ "About Us," Consortium of S&T and R&D Libraries of Pakistan (CSTRDLP), accessed March 22, 2022, <http://consortium.pastic.gov.pk>.
- ⁶⁷ Ashraf Sharif, "Integrating Libraries across Continents: A Case of Aga Khan University's Nine Libraries in Five Countries," (paper, National Conference on Career Development of LIS Professionals and Overall Improvement of Libraries in Pakistan, Islamabad, 2012): 1–12, <https://ecommons.aku.edu/libraries/18>.

- ⁶⁸ Sania Awais and Kanwal Ameen, "The Current Innovation Status of University Libraries in Pakistan," *Library Management* 40, no. 3/4 (2019): 178–90, <https://doi.org/10.1108/LM-11-2017-0125>.
- ⁶⁹ "Participants of Digital Library," Higher Education Commission (HEC) of Pakistan, accessed March 24, 2022, <http://digitallibrary.edu.pk/institutes.php>.
- ⁷⁰ Warraich and Rorissa, "Adoption," 8; Rafiq, Ameen, and Jabeen, "Barriers," 465; Shamshad Ahmed, Arslan Sheikh, and Muhammad Akram, "Implementing Knowledge Management in University Libraries of Punjab, Pakistan," *Information Discovery and Delivery* 46, no. 2 (2018): 83–94, <https://doi.org/10.1108/IDD-08-2017-0065>; Sabah Jan, "Status of Electronic Resources in Libraries: A Review Study," *Library Philosophy and Practice* 2019, no. 2524 (2019): 1–20, <https://digitalcommons.unl.edu/libphilprac/2524>.
- ⁷¹ Warraich and Rorissa, "Adoption," 1, 7–9; Rafiq, Ameen, and Jabeen, "Barriers," 459, 460; Ahmed, Sheikh, and Akram, "Knowledge Management," 84.
- ⁷² Rafiq and Ameen, "Digitization Framework," 26; Rafi, Ali, and Ahmad, "Khyber Pakhtunkhawa," 39; Kanwal Ameen, "Changing Scenario of Librarianship in Pakistan: Managing with the Challenges and Opportunities," *Library Management* 32, no. 3 (2011): 171–82, <https://doi.org/10.1108/01435121111112880>.
- ⁷³ Rafiq, Ameen, and Jabeen, "Barriers," 463; Asad Khan, Mohamad Noorman Masrek, Khalid Mahmood, and Saima Qutab, "Factors Influencing the Adoption of Digital Reference Services among the University Librarians in Pakistan," *The Electronic Library* 35, no. 6 (2017): 1225–46, <https://doi.org/10.1108/EL-05-2016-0112>; Ghalib Khan and Rubina Bhatti, "The Impact of Higher Education Commission of Pakistan's Funding on the Collection Development Budgets of University Libraries," *The Bottom Line* 29, no. 1 (2016): 12–24, <https://doi.org/10.1108/BL-06-2015-0008>.
- ⁷⁴ Irfan Ullah, Shah Khusro, Asim Ullah, and Muhammad Naeem, "An Overview of the Current State of Linked and Open Data in Cataloging," *Information Technology and Libraries* 37, no. 4 (2018): 47–80, <https://doi.org/10.6017/ital.v37i4.10432>; Wahid, Warraich, and Tahira, "Mapping," 593.
- ⁷⁵ Rafiq, Ameen, and Jabeen, "Barriers," 460.
- ⁷⁶ Piracha and Ameen, "Policy and Planning," 39, 42; Ahmed, Sheikh, and Akram, "Knowledge Management," 85.
- ⁷⁷ Warraich and Rorissa, "Adoption," 7, 8; Jan, "Status," 13.
- ⁷⁸ Sania Awais and Kanwal Ameen, "Information Accessibility for Students with Disabilities: An Exploratory Study of Pakistan," *Malaysian Journal of Library & Information Science* 20, no. 2 (2017): 103–15, <https://mjlis.um.edu.my/article/view/1768>; Khan, Idrees, and Mudassir, "Accessibility Evaluation," 6.

- ⁷⁹ Nosheen Fatima Warraich, Amara Malik, and Kanwal Ameen, "Gauging the Collection and Services of Public Libraries in Pakistan," *Global Knowledge, Memory and Communication* 67, no. 4/5 (2018): 244–58, <https://doi.org/10.1108/GKMC-11-2017-0089>.
- ⁸⁰ Alia Arshad and Kanwal Ameen, "Scholarly Communication in the Age of Google: Exploring Academics' Use Patterns of E-journals at the University of the Punjab," *The Electronic Library* 35, no. 1 (2017): 167–84, <https://doi.org/10.1108/EL-09-2015-0171>.
- ⁸¹ Khan and Bhatti, "Collection Development," 242, 251.
- ⁸² Khurshid Ahmad and Muhammad Rafiq, "Methods of Knowledge Management Practices in Pakistani Universities' Libraries," *NUST Journal of Social Sciences and Humanities* 4, no. 1 (2018): 115–26, <https://doi.org/10.51732/njssh.v4i1.30>.
- ⁸³ Piracha and Ameen, "Policy and Planning," 42.
- ⁸⁴ Piracha and Ameen, "Policy and Planning," 39.
- ⁸⁵ Khan and Bhatti, "Collection Development," 248–49; Rafi, Ali, and Ahmad, "Khyber Pakhtunkhawa," 34, 41, 45; Muhammad Arif and Khalid Mahmood, "The Changing Role of Librarians in the Digital World: Adoption of Web 2.0 Technologies by Pakistani Librarians," *The Electronic Library* 30, no. 4 (2012): 469–79, <https://doi.org/10.1108/02640471211252184>; Warraich, Malik, and Ameen, "Gauging," 249–55; Amjid Khan and Shamshad Ahmed, "Analyzing the Relationship between Organizational Culture and Lifelong Learning among the Information Professionals in the University Libraries of Pakistan," *Information Discovery and Delivery* 50, no. 1 (2022): 1–11, <https://doi.org/10.1108/IDD-01-2019-0001>; Ahsan Ullah and Harron Idrees, "Technical Staff Positions and Technology Related Tasks: A Study of University Libraries in Pakistan," *Pakistan Journal of Information Management & Libraries* 18, no. 1 (2017): 52–61, <https://ssrn.com/abstract=2918822>.
- ⁸⁶ Khan and Bhatti, "Collection Development," 242; Rafi, Ali, and Ahmad, "Khyber Pakhtunkhawa," 44; Marwat and Younus, "College Libraries," 27; Shehzad Ahmad and Sajjad Ahmad, "Status of ICT in the University Libraries of Khyber Pakhtunkhwa," *Pakistan Library & Information Science Journal* 48, no. 2 (2017): 37–48; Sajjad Ahmad, Shehzad Ahmad, and Muhammad Arshad, "Attitude of University Information Professionals' toward the Use and Application of ICT: A Case of Khyber Pakhtunkhwa," *Pakistan Library & Information Science Journal* 51, no. 3 (2020): 51–64; Rabia Abdul Karim and Anila Fatima Shakil, "A Research Study about the Importance of E Library for Globalized Learning among Students at University Level in Karachi, Pakistan," *RADS Journal of Social Sciences & Business Management* 4, no. 2 (2017): 104–14, <http://www.jssbm.iuw.edu.pk/index.php/jssbm/article/view/45>.
- ⁸⁷ Piracha and Ameen, "Policy and Planning," 39–41; Rafi, Ali, and Ahmad, "Khyber Pakhtunkhawa," 44; Warraich, Malik, and Ameen, "Gauging," 249; Ahmad, Ahmad, and Kamran, "Sharing," 45; Ullah and Idrees, "Technical Staff," 59; Ahmad and Ahmad, "ICT," 37; Karim and Shakil, "Globalized Learning," 113; Warraich and Rorissa, "Adoption," 8; Siddique and Mahmood, "Pakistan," 237.

- ⁸⁸ Rafiq, Ameen, and Jabeen, "Barriers," 463–66.
- ⁸⁹ Murtaza Ashiq, Shafiq Ur Rehman, and Syeda Hina Batool, "Academic Library Leaders' Conceptions of Library Leadership in Pakistan," *Malaysian Journal of Library & Information Science* 24, no. 2 (2019): 55–71, <https://doi.org/10.22452/mjlis.vol24no2.4>; Piracha and Ameen, "Policy and Planning," 42, 43; Amara Malik and Kanwal Ameen, "Library and Information Science Collaboration in Pakistan: Challenges and Prospects," *Information and Learning Science* 119, no. 9/10 (2018): 555–71, <https://doi.org/10.1108/ILS-09-2017-0096>.
- ⁹⁰ Rafiq, Ameen, and Jabeen, "Barriers," 463–67; Marwat and Younus, "College Libraries," 24; Siddique and Mahmood, "Library Software," 61.
- ⁹¹ Mirza and Arif, "Challenges," 113.
- ⁹² Marwat and Younus, "College Libraries," 39; Ahmad and Ahmad, "ICT," 38–47; Siddique and Mahmood, "Pakistan," 224, 234, 235.
- ⁹³ Shakeel Ahmad Khan and Rubina Bhatti, "Digital Competencies for Developing and Managing Digital Libraries: An Investigation from University Librarians in Pakistan," *The Electronic Library* 35, no. 3 (2017): 573–97, <https://doi.org/10.1108/EL-06-2016-0133>.
- ⁹⁴ Midrar Ullah, "Content Analysis of Medical College Library Websites in Pakistan Indicates Necessary Improvements," *Health Information & Libraries Journal* (14 July, 2021): 1–10, <https://doi.org/10.1111/hir.12386>.
- ⁹⁵ Ganaee and Rafiq, "Pakistani University Library Web Sites," 294, 303–9.
- ⁹⁶ Ganaee, "Library Websites," 385.
- ⁹⁷ Arslan Sheikh, "Development of Information Commons in University Libraries of Pakistan: The Current Scenario," *The Journal of Academic Librarianship* 41, no. 2 (2015): 130–39, <https://doi.org/10.1016/j.acalib.2015.01.002>.
- ⁹⁸ Piracha and Ameen, "Policy and Planning," 39, 42, 43.
- ⁹⁹ Piracha and Ameen, "Policy and Planning," 42.
- ¹⁰⁰ Malik and Ameen, "Collaboration," 563, 564.
- ¹⁰¹ Waqar Ahmad, Muhammad Shahid Soroya, and Munazza Jubeen, "Electronic, Librarian's End, Techno Knowledge and Multifactor Services in the Special Libraries of Lahore," *Pakistan Library & Information Science Journal* 48, no. 4 (2017): 102–14, <https://www.researchgate.net/publication/334546141>.
- ¹⁰² Nadeem Siddique and Khalid Mahmood, "Combating Problems Related to Library Software in Higher Education Institutions of Pakistan: An Analysis of Focus Groups," *Malaysian Journal of Library & Information Science* 21, no. 1 (2016): 35–51, <https://doi.org/10.22452/mjlis.vol21no1.3>.

- ¹⁰³ Ashiq, Rehman, and Batool, "Library Leaders," 61–68.
- ¹⁰⁴ Waqar Ahmed, "Third Generation of the Web: Libraries, Librarians and Web 3.0," *Library Hi Tech News* 32, no. 4 (2015): 6–8, <https://doi.org/10.1108/LHTN-11-2014-0100>.
- ¹⁰⁵ Abid Hussain and Saeed Ullah Jan, "Awareness of Web 2.0 Technology in the Academic Libraries: An Islamabad Perspective," *Library Philosophy and Practice* 2018, no. 1945 (2018): 1–13, <https://digitalcommons.unl.edu/libphilprac/1945>; Azizur Rahman, Amjid Khan, and Ghalib Kan, "Assessment of Web 2.0 Applications in University Libraries of Khyber Pakhtunkhwa," *Pakistan Library & Information Science Journal* 50, no. 3 (2019): 9–18; Muhammad Tufail Khan and Muhammad Rafiq, "Library Social Media Services (LSMS)! Going Viral for Survival," *Pakistan Library & Information Science Journal* 50, no. 3 (2019): 23–32.
- ¹⁰⁶ Ullah et al., "Current State," 64–66.
- ¹⁰⁷ Muhammad Yousuf Ali, Salaman Bin Naeem, and Rubina Bhatti, "Artificial Intelligence Tools and Perspectives of University Librarians: An Overview," *Business Information Review* 37, no. 3 (2020): 116–24, <https://doi.org/10.1177/0266382120952016>.
- ¹⁰⁸ Y. M. Atiquil Islam, Khurshid Ahmad, Muhammad Rafi, and Zheng JianMing, "Performance-Based Evaluation of Academic Libraries in the Big Data Era," *Journal of Information Science* 47, no. 4 (2020): 458–71, <https://doi.org/10.1177/0165551520918516>.
- ¹⁰⁹ Abid Hussain and Muhammad Ibrahim, "Research Productivity of Library and Information Science in Khyber Pakhtunkhwa: A Case Study of Sarhad University of Science Peshawar, Pakistan," *Journal of Information Management and Library Studies* 1, no. 1 (2018): 54–63, <http://jimls.kkkuk.edu.pk/jimls/index.php/jimls/article/view/14>.
- ¹¹⁰ Shamshad Ahmed and Atta Ur Rehman, "Perceptions and Level of ICT Competencies: A Survey of Librarians at Public Sector Universities in Khyber Pakhtunkhwa, Pakistan," *Pakistan Journal of Information Management and Libraries* 18, no. 1 (2016): 1–11, <http://journals.pu.edu.pk/journals/index.php/pjiml/article/viewArticle/951>; Altaf and Warraich, "Awareness," 14–22; Munir Moosa Sadruddin, "Contribution of Digital Libraries and Its Role in Reaping Quality Researches in Pakistan – Challenges and Opportunities," *Pakistan Library & Information Science Journal* 46, no. 1 (2015): 60–70.
- ¹¹¹ Muhammad Umar Farooq, Ahsan Ullah, Memoona Iqbal, and Abid Hussain, "Current and Required Competencies of University Librarians in Pakistan," *Library Management* 37, no. 8/9 (2016): 410–45, <https://doi.org/10.1108/LM-03-2016-0017>.
- ¹¹² Sheikh, "Information Commons," 138.
- ¹¹³ Kimberly L. Armstrong and Thomas H. Teper, "Library Consortia and the CIC: Leveraging Scale for Collaborative Success," *Serials Review* 43, no. 1 (2017): 28–33. <https://doi.org/10.1080/00987913.2017.1284493>.
- ¹¹⁴ Armstrong and Teper, "Library Consortia," 30–32.
- ¹¹⁵ "About Us," PASTIC.

- ¹¹⁶ “Objectives,” PASTIC.
- ¹¹⁷ Ullah et al, “Current State,” 64–66.
- ¹¹⁸ Ullah et al., “Current State,” 64–67.
- ¹¹⁹ Bilal Hassan, Ramsha Ahmed, Bo Li, Ayesha Noor, and Zahid ul Hassan, “A Comprehensive Study Capturing Vision Loss Burden in Pakistan (1990–2025): Findings from the Global Burden of Disease (GBD) 2017 Study,” *PloS one* 14, no. 5 (2019): e0216492, <https://doi.org/10.1371/journal.pone.0216492>.
- ¹²⁰ Izaz Khan, Shah Khusro, and Irfan Ullah, “Technology-Assisted White Cane: Evaluation and Future Directions,” *PeerJ* 6, no. e6058 (2018.): 1–27, <https://doi.org/10.7717/peerj.6058>.
- ¹²¹ Awais and Ameen, “Information Accessibility,” 111–13.
- ¹²² “Smartphone Usage in Pakistan,” accessed March 24, 2022, <https://pas.org.pk/smart-phone-usage-in-pakistan-infographics>.
- ¹²³ “Smartphone Penetration Rate as Share of Connections in Pakistan from 2014 to 2020,” Statista Research Department, December 30, 2016, <https://www.statista.com/statistics/671542/smartphone-penetration-as-share-of-connections-in-pakistan>.
- ¹²⁴ “Telecom Indicators,” Pakistan Telecommunication Authority, January 2022, <https://www.pta.gov.pk/en/telecom-indicators>