Journal of Management Science Research Review
https://jmsrr.com/index.php/Journal/about

Volume. 4 Issue No. 3 (2025)

Online ISSN: 3006-2047
Print ISSN: 3006-2039

Factors Influencing Data Competency among Academic Librarians in Islamabad: Current Trends, Future Competencies, and Institutional Challenges

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Abstract
In the evolving digital landscape, academic librarians play a pivotal role in supporting data-driven research. This study explores factors influencing data competency among academic librarians in Islamabad, focusing on current practices, future skills, and institutional challenges. A quantitative research design was employed, using a structured questionnaire validated by subject experts. The survey, distributed via Google Forms to 250 librarians, received 225 valid responses (90% response rate). Data were analyzed using SPSS 27. Findings reveal that librarians are actively engaged in data-related tasks such as analysis, management, visualization, and research support. However, barriers such as lack of formal training, limited institutional backing, outdated curricula, and workload constraints hinder competency development. Despite challenges, respondents showed strong optimism about enhancing data skills and highlighted the need for training, policy reforms, and curriculum updates. This study offers practical recommendations for stakeholders and policymakers to strengthen data competencies and align academic libraries with emerging digital research needs.

Keywords: Data Competency; Data skills; Academic librarians; Current Trends; Institutional Challenges; Islamabad

Introduction

The academic environment has heightened the demand for librarians with advanced data competencies, particularly in the era of data-intensive research. In the digital landscape, academic librarians play crucial roles in supporting research, data curation, and information analytics(Creamer et al., 2012). Academic institutions around the world are embracing digital transformation, and libraries are particularly key agents of these transformational phases(Hussain, 2020). The ability of librarians to manage, analyze, and support data-driven research is becoming a cornerstone of effective

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Online ISSN: 3006-2047
Print ISSN: 3006-2039

library service delivery. Academic libraries in Islamabad follow the lead of advanced countries in equipping themselves with the necessary knowledge, skills, and abilities (KSAs). Library and Information Science (LIS) as a discipline has consistently emphasized continuing professional education to equip our library practitioners with the latest knowledge and skills to adapt to changing user demands and technological advancements Hussain and Jan (2018). As library services evolve rapidly in response to the changing nature of technologies, libraries are experimenting with innovative services to fulfil their users' demands (Hussain, 2019). The latest technologies, such as AI-driven applications and Information and Communication Technologies, have been incorporated into academic libraries to solve the complex problems of their patrons. Among them, the most significant shift in the current era is the rise of research data services. Librarians of the 21st century are now expected to perform tasks such as data curation, mining, analytics, and visualization, as these services have become integral to the academic landscape (Hussain, 2023).

The evolving responsibilities of librarians reflect broader global trends but also require a localized understanding, particularly in developing contexts such as Pakistan. Librarians in advanced countries, such as the United States, the United Kingdom, Germany, and Canada, are concerned about how such competencies are fostered, supported, or hindered at the institutional level. The current trend among these librarians regarding data competency highlights the growing importance of digital literacy, data ethics, and technical agility in academic librarianship. In the current century, academic librarians are increasingly involved in interdisciplinary collaboration, and they are struggling to offer data-centric services to faculty members, researchers, and the scholarly realm. This effort aims to build strong communication skills with these communities to fulfil their data needs in times of need (Hussain & Richardson, 2024). Although countries based on research and development (R&D) have recognized the services of librarians in data competencies, they still provide timely services. Their services are recognized globally. When it comes to developing countries' academic libraries, their development in specific localities, such as Islamabad, must be assessed in the context of both public and private sector universities(Luo & Tang, 2024). Without digital data competencies among librarians and the prevailing professional culture within libraries, it is assumed that librarians without such skills will likely focus on advanced data analytics, research support services, open science frameworks, and intelligence applications (Hussain & Khan, 2025). There is a dire need for a proactive approach and capacity building within LIS education and on-the-job training programs to address this problem, as librarians without these skills will remain outdated(Hussain & Ismail, 2024).

To promote continuous learning and technological adoption, institutions in Pakistan must prioritize sustained investment in technical infrastructure, policy frameworks, and data competency among librarians, particularly in higher education institutions. Despite the recognized need for data competencies, academic libraries in Islamabad face several challenges, including limited access to data-related training, a lack of formal policies, and insufficient staffing. Ostensibly, data competency skills of librarians are linked with innovative information systems (Creamer et al., 2012). The

Volume. 4 Issue No. 3 (2025)
Online ISSN: 3006-2047
Print ISSN: 3006-2039

absence of an innovative system creates barriers in a resource-constrained environment. To examine current trends, future competencies, and evaluate the institutional challenges that impede their advancement in data competency skills are crucial factors that need to be addressed (Hussain, 2025b). Hence, the purpose of this research is to highlight the core issues relevant to the data competency skills of librarians in higher educational institutions, and to meet the emerging needs of their patrons, aligning Pakistani academic librarians with international standards.

Statement of the Problem

Academic librarians around the world are increasingly expected to advance their data competency skills to meet the growing demands of their patrons. As libraries evolve their services over time in this rapidly evolving digital environment, new challenges also arise to meet the aligned goals of their institutions. Data-intensive research and data services are now being conducted in advanced countries; however, the role of academic librarians in Islamabad remains unclear regarding how to effectively adopt data competency skills to meet the demands of their patrons. Despite the global recognition of academic librarian towards data literacy, its importance, infrastructure and existing competencies, academic librarians in Islamabad are far behind due to many reasons such as lack of administrative support, insufficient collaborations with academic departments, limited access to trainings and outdated LIS curricula in the country persist, hindering librarians to acquire these skills in the time of needs. There is a gap in identifying the current trends in data competency among academic librarians, as well as future competencies and institutional challenges. The purpose of this study is to identify the gap among academic librarians in public and private sector universities of Islamabad. The study provides a comprehensive roadmap for professional development, offering background knowledge and insights for institutional reforms that will inform future research in the field.

Literature Review

Librarians worldwide reassess their services to meet the evolving needs of their patrons in the 21st-century digital landscape. This changing role of academic librarians not only compels them to learn new skills but also urges them to equip themselves with the changing demands of their end users, particularly faculty members and researchers. Librarians in data-intensive research environments are seeking new skills, which are collectively referred to as data competency skills. The word "competency," as defined by (Naveed et al., 2022), is the integration of knowledge, attitude, skills, and values within a particular context to achieve a prescribed standard or performance. Other scholars, such as(Creamer et al., 2012), describe professional competency as a cluster of attributes essential for effectively mastering job responsibilities. In the field of library and information science, competencies are considered teachable, measurable, and context-sensitive. The development of competency skills is crucial in research organizations, particularly in academic institutions. In the realm of data services, librarians are increasingly expected to manage, analyze, and curate large datasets. Hence, data competency skills have become essential for librarians in the

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21st century(Badenhorst, 2022). The status of Academic librarians in Pakistan, particularly in universities, remains unclear. This research provides an overview of the factors influencing data competency among librarians in Islamabad. The existing literature underscores that data services are experiencing exponential growth in academic libraries; however, engagement with data tasks remains uneven. Librarians in specialized roles often handle data on a regular basis, whereas those in general positions engage less frequently. Core data competencies identified in recent studies include data management, metadata creation, repository administration, digitization, and compliance with funders' data policies(H. R. Khan & Du, 2018).

Additionally, there is growing recognition of the need for data visualization, analytics, and information and communication technology (ICT) skills. Despite these recognized needs, the integration of data competencies into daily library operations remains limited. The increasing centrality of big data in academia has highlighted a strong correlation between librarians' data skills and the successful implementation of advanced library services such as digital repositories, data-driven acquisitions, and predictive analytics (Hussain & Shahid, 2022). Data librarians are not necessarily expected to be expert programmers; however, familiarity with programming logic, databases, and information retrieval tools is beneficial (Cox et al., 2019). Librarians must possess consultation and instructional support capabilities, conduct workshops, and guide researchers in best practices for data management, particularly in designing data management plans (Ihsan et al., 2025).

Librarians in the current arena are deeply embedded in the research process; they are expected to acquire advanced competencies that blend both traditional and new technology-driven skills. The evolving role of librarians in the 21st century has seen librarians engaging in interdisciplinary collaboration to facilitate data literacy and integrate analytics into service delivery (Creamer et al., 2012). For this transition, professional development is a vital factor. Libraries in advanced countries offer workshops, training programs and roadshows to address the widening data skill gap. In this regard, the role of library Associations, such as the American Library Association (ALA) and the International Federation of Library Associations (IFLA), as well as numerous other associations, is a vital factor in learning these skills through professional development programs. Strong collaborations with IT professionals and researchers at higher education institutions are essential for strong interpersonal skills and the ability to translate complex data concepts into assessable information. Additionally, listening skills play a crucial role in understanding the diverse data needs of researchers. These skills provide comprehensive support services for data analytical skills (Hussain & Richardson, 2024).

Academic librarians in both advanced and developing countries face substantial institutional challenges that hinder librarians' development in data competency skills. Several common challenges include a lack of administrative support, insufficient funding for professional development, and a lack of collaboration among IT staff, research scholars, and unclear direction regarding data, which are some prevailing barriers. Some scholars, such as (Rabasa & Abrizah, 2022), have argued that academic librarians face several challenges in developing data proficiency skills. The

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study further elaborates that approximately 26% of the respondents claimed inadequate support from the administrative side, while 34% librarians claimed that they have insufficient time for learning these skills. In their study, some scholars, such as (Federer, 2018), identify outdated LIS curricula in library schools, as well as common challenges faced by librarians in academic libraries, including data visualization skills, research data management (RDM), and digital preservation.

Furthermore, (Creamer et al., 2012) discovered that new degree holders are underprepared for data-intensive work, and data preservation is a core issue faced by librarians in developing countries. In their study, (Hussain & Rafiq, 2025; Hussain, 2024) postulate that academic librarians in Pakistan lack staffing, budget, and infrastructure to create a robust data service. At the same time, (Luo & Tang, 2024) argue that resource constraints also limit the role of librarians in data skills. Some scholars further highlight that there is a lack of proper resources for handling large and diverse datasets, which creates hurdles for librarians in Pakistan (Adil et al., 2025).

Additionally, the complexity of managing large and diverse datasets poses another significant challenge for academic librarians in Pakistan. Hence, this study provides information in both theoretical and practical aspects to academic librarians in Pakistan and beyond. Numerous research studies have been conducted on data competencies in advanced countries. Still, no research has been undertaken in developing countries like Pakistan, which encompasses several factors influencing data competency among academic librarians in Islamabad. It also examines the current trends, future competencies, and challenges faced by the institutions in Islamabad.

Research Methodology

The present study employed a quantitative research approach. A structured questionnaire was prepared based on the past studies. The use of structured questionnaires in quantitative studies is helpful to collect standardized data from a large and diverse population. As mentioned in the study by (Masrek & Hussein, 2021) (2021), this method ensures consistency, ease of analysis, and broader generalizability of results. The study's targeted populations include academic librarians working in public and private sector universities across Islamabad. The sample size for this study was N = 250, comprising targeted librarians, and was collected using a convenience sample. For data collection, initially, emails and contact information were collected from university websites and librarians' directories (Hussain & Khan, 2025). After preparing the draft questionnaire, it was shared with research scholars in the library science field to check its validity. Some minor changes were made and ratified based on their feedback. Initially, the questionnaire was posted on Google Forms and shared with 25 librarians, who were then excluded from the original survey. The survey consisted of closed-ended items measured using a 5-point Likert scale, with one indicating "strongly disagree" and five indicating "strongly agree." The instruments assessed the librarians' engagement with data practices, institutional support mechanisms, the challenges they faced in developing their competencies, and their future competency needs. Initially, only 127 respondents completed the questionnaire,

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but after follow-up via WhatsApp groups and personal emails, 225 respondents participated in the survey (90%). The data were initially coded in a Microsoft Excel sheet and then imported into SPSS version 27. The data were analyzed using descriptive statistics, including means and standard deviations, to interpret the frequency and intensity of responses. Tables were used to present demographic characteristics, current trends, challenges, and future expectations related to data competencies.

Research Questions

What are the current trends in data competency among academic librarians in Islamabad?

What future data-related competencies are anticipated to be essential for academic librarians in Islamabad?

What institutional challenges hinder the development of data competency among academic librarians in Islamabad?

Findings

Table 1 shows the demographic characteristics of the 225 academic librarians who participated in the study. Each variable—gender, age, designation, and experience—is described with its corresponding frequency, and the valid percentages are described in detail. The sample is almost evenly divided by gender. Males slightly outnumber females by a small margin (just 7 participants), representing 51.3% of the sample. The largest age group is 25–34 years (40%), suggesting that a significant portion of the respondents are early to mid-career professionals. A notable portion (25.8%) is aged 45–54, indicating a strong presence of senior professionals. The 35–44 age group comprises a very small proportion of individuals (8.4%), which may indicate either career transitions or inconsistencies in data reporting. The youngest (under 25) and oldest (55 and above) groups each make up roughly 13% of the sample. The designation section reveals that Chief Librarians (38.7%) constitute the largest group, indicating that many respondents hold senior-level positions. Assistant Librarians (assuming a correct frequency of 70) likely make up the second-largest group (~31.1%), reflecting a significant mid-level workforce. Deputy Librarians and Library Assistants are equally represented (14.7% each). Nearly half of the respondents (47.1%) have 6 to 10 years of experience, indicating that a large proportion of librarians are in the early to mid-stages of their careers. While 26.7% have 11–15 years of experience, and 11.6% have more than 15 years, representing more experienced professionals. 14.2% are relatively new to the field (under 5 years), indicating a steady entry of new professionals into the academic library system. Complete details of the demographic characteristics of respondents are shown in Table 1 below:

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Table 1: Demographic Characteristics of Respondents

		Frequency	Valid Percent
Gender	Male	116	51.3
	Female	109	48.7
Age in Years	Under 25	28	12.4
	25–34	90	40.0
	35–44	19	8.4
	45–54	58	25.8
	55 and above	30	12.9
Designations	Chief Librarian	87	38.7
	Deputy Librarian	34	14.7
	Assistant Librarian	70	70
	Library Assistant	34	14.7
Experience in Years	Less than 5 years	32	14.2
	6–10 years	106	47.1
	11–15 years	60	26.7
	More than 15 years	27	11.6
	Total	**225**	**100**

Table 2 describes the current trends among academic libraries towards Data competency skills. All statements reflect positive perceptions and practices related to data activities in academic libraries. The mean scores range from 4.11 to 4.50, indicating overall agreement. Statement one shows, "I regularly engage in tasks that involve data collection and analysis in my library work" (Mean = 4.11, Standard Deviation = 1.059). This average score indicates that respondents generally agree that they are involved in data collection and analysis. "Our library has policies in place to support data-driven services (Mean = 4.21, Standard Deviation = 0.909) shows a positive agreement that libraries have formal policies supporting data-driven initiatives. "I am familiar with basic data management practices (e.g., data cleaning, organizing)" (Mean = 4.41, Standard Deviation = 1.036); this high mean suggests that a majority of librarians consider themselves familiar with core data management practices. "I use data to assess library services and user needs (Mean = 4.50, Standard Deviation = 0.768); this shows strong agreement that data is widely used to evaluate library services and user behaviour. "The institution I work at supports training in data literacy or data management" (Mean = 4.46, Standard Deviation = 0.886). This high mean suggests that institutions are actively supporting professional development in data literacy and management. "I have access to the necessary tools and software for handling data (e.g., Excel, SPSS, Open Refine)" (Mean = 4.48, Standard Deviation =

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0.762); this mean score indicates that most librarians have access to essential data tools and software. "My library collaborates with academic departments to support research data needs" (Mean = 4.49, Standard Deviation = 0.902). This response indicates strong collaboration between libraries and academic departments in supporting research data services.

Table 2: Current Trends in Data Competency

	N	Mean	Std. Deviation
I regularly engage in tasks that involve data collection and analysis in my library work	225	4.11	1.059
Our library has policies in place to support data-driven services	225	4.21	.909
I am familiar with basic data management practices (e.g., data cleaning, organizing)	225	4.41	1.036
I use data to assess library services and user needs	225	4.50	.768
The institution I work at supports training in data literacy or data management	225	4.46	.886
I have access to the necessary tools and software for handling data (e.g., Excel, SPSS, Open Refine)	225	4.48	.762
My library collaborates with academic departments to support research data needs	225	4.49	.902
Valid N (listwise)	225		

Table 3 presents the responses of 225 academic librarians to seven statements about emerging data-related skills and responsibilities. Each item was likely rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The mean (average score) reflects the general level of agreement, while the Standard Deviation (SD) indicates how much individual responses vary from the average. Data literacy will be a core skill for academic librarians shortly (Mean = 4.28, SD = 0.879). This indicates a strong consensus that data literacy is becoming increasingly essential for academic librarians. The SD indicates a moderate level of variation, showing that while most respondents agreed, a few had differing views. "I believe librarians should be able to support data visualization and presentation" (Mean = 4.33, SD = 0.926). This reflects broad agreement on the importance of librarians developing skills in data visualization and presentation. "Librarians must be equipped to assist researchers with research data management plans" (Mean = 4.14, SD = 0.951). At the same time, the mean still shows agreement; however, it is the lowest among all items, indicating that this responsibility may not yet be universally accepted or understood. "Knowledge of open data and FAIR principles will be essential in academic librarianship" (Mean = 4.34, SD = 0.902). A high mean indicates strong agreement on the growing importance of open data and the FAIR principles (Findable, Accessible, Interoperable, Reusable)." Skills in data privacy and ethical data use will be increasingly important (Mean = 4.44, SD = 0.890). This item received a very high level of agreement, reflecting a strong awareness of privacy and ethical concerns in data handling.

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"Academic librarians should be trained in data repositories and digital preservation techniques" (Mean = 4.70, SD = 0.735). This statement had the highest mean score, showing almost unanimous agreement that training in repositories and preservation is critical. "The integration of data services will enhance the strategic role of libraries (Mean = 4.68, SD = 0.741); this also shows firm agreement, with librarians viewing data service integration as a way to increase libraries' value and impact.

Table 3: Future Competencies Required for Librarians

	N	Mean	Std. Deviation
Data literacy will be a core skill for academic librarians shortly	225	4.28	.879
I believe librarians should be able to support data visualization and presentation	225	4.33	.926
Librarians must be equipped to assist researchers with research data management plans.	225	4.14	.951
Knowledge of open data and FAIR principles will be essential in academic librarianship	225	4.34	.902
Skills in data privacy and ethical data use will be increasingly important	225	4.44	.890
Academic librarians should be trained in data repositories and digital preservation techniques	225	4.70	.735
The integration of data services will enhance the strategic role of libraries	225	4.68	.741
Valid N (listwise)	225		

This table reflects the perceptions of 225 academic librarians regarding the barriers to developing data-related competencies in academic libraries. Statement 1, "Lack of formal training opportunities hinders the development of data competencies" (Mean = 4.55, Standard Deviation = 0.706), indicates strong agreement that the absence of formal training is a significant obstacle to building data skills. The low standard Deviation shows high consistency in responses, suggesting a shared concern among librarians. "There is limited institutional support for professional development in data skills" (Mean = 4.69, Standard Deviation = 0.654), the mean score in the table, showing firm consensus that institutional support is lacking. "Heavy workloads leave little time to focus on developing data-related skills" (Mean = 4.35, Standard Deviation = 0.879). It suggests that many librarians agree that their workload limits time for skill development. Similarly, "There is a lack of awareness about the importance of data literacy among librarians" (Mean = 4.09, Standard Deviation = 0.992), which shows moderate to strong agreement that awareness is lacking among peers. "I feel underprepared to handle data-intensive user inquiries" (Mean = 4.19, Standard Deviation = 1.002); this shows that many librarians feel unprepared, though not overwhelmingly so. "Financial constraints prevent libraries from investing in data tools and training" (Mean = 4.06, Standard Deviation = 1.321). This mean is

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relatively lower than others but still indicates general agreement. "There is a lack of collaboration between libraries and research departments in data-related matters" (Mean = 4.43, Standard Deviation = 0.884). This score reflects strong agreement that collaboration between libraries and academic departments is limited. In general, all means are above 4.00, showing widespread recognition of multiple barriers to developing data-related competencies. The challenges in developing Data Competency are shown in Table 4 below:

Table 4: Challenges in Developing Data Competency

	N	Mean	Std. Deviation
Lack of formal training opportunities hinders the development of data competencies	225	4.55	.706
There is limited institutional support for professional development in data skills	225	4.69	.654
Heavy workloads leave little time to focus on developing data-related skills	225	4.35	.879
There is a lack of awareness about the importance of data literacy among librarians	225	4.09	.992
I feel underprepared to handle data-intensive user inquiries	225	4.19	1.002
Financial constraints prevent libraries from investing in data tools and training	225	4.06	1.321
There is a lack of collaboration between libraries and research departments in data-related matters	225	4.43	.884
Valid N (listwise)	225		

Discussion

The findings of this study reveal a growing trend among academic librarians in Pakistan, with the majority emphasizing data competencies. The findings reflect that librarian in Pakistan are following the global trends in data competencies and skills. Based on the demographic profile in Table 1 indicates that there is a reasonably balanced distribution between the two genders, with 51.3% male and 48.7% female respondents. The age distribution of respondents reflects that (40%) are aged between 25 and 34 years, and that younger people are more adopters of data competencies than other fields of age groups. The result also denotes that there is a substantial number of respondents between 6-10 years, with (47.1%) reporting 6–10 years of experience; this data shows that mid-career respondents are more adopters than early-career and older employees. The findings of this study corroborate, who report that young staff have a greater tilt towards Data competencies skills than conventional librarianship.

Table 2 of the study demonstrates the current trends in data competency. It shows that librarians, regarding the use and importance of data-related tasks across all

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items (ranging from 4.11 to 4.50), suggest that data collection, assessment, and management practices are becoming essential parts of academic librarianship in Pakistan. This aligns with the findings of (Rabasa & Abrizah, 2022), who discovered that data-informed decision-making is becoming increasingly critical in academic libraries. The findings also show that there is widespread access to data tools, such as Microsoft Excel and SPSS, across different institutions in Pakistan, indicating that most libraries are equipped with the necessary infrastructure to support data literacy among expert staff (Hussain, 2025) . It appears that librarians are becoming active partners of research scholars in managing research data. The findings of this study corroborate those of, who postulated that a strong bond between librarians and research scholars in academic organizations decreases the burden on faculty staff.

Similarly, the findings in Table 3 highlight the future competency needs of academic librarians. The result emphasizes that academic librarians perceive future competencies in data literacy as essential and crucial components of academic libraries(Hussain & Ismail, 2022). High mean scores on all statements (ranging from 4.14 to 4.70) demonstrate consensus on the importance of training in data repositories and preservation techniques. The findings of this table also denote that librarian should be trained in data repositories and digital preservation techniques to protect the data for future generations. This suggests that librarians are expected to play a pivotal role in digital scholarship and long-term data stewardship. The findings closely support the study by(Creamer et al., 2012), who report that librarians in academic settings should focus on developing future data competency skills, as without such skills, the role of librarians will remain passive in organizations.

According to the report in Table Four, the study suggests that despite a positive outlook on data competency in developing countries like Pakistan, academic librarians in advanced nations also face several significant barriers to developing data competencies. The most pressing challenge identified was the limited institutional support and lack of formal training opportunities for librarians in both developed and developing countries (Hussain, 2022). The results of this study also support the findings of (Tanloet & Tuamsuk, 2011; Hussain, 2023), who report that librarians in advanced countries face several challenges in developing data competency skills, with the most pressing challenges being a lack of organizational support and a limited budget for librarians' training. The findings in Table 4 suggest that there is inadequate organizational support for the librarian to acquire these skills. The study also suggests that a heavy workload on librarians, combined with a lack of collaboration with research departments, further constrains librarians' ability to engage meaningfully with data services. The findings of this table corroborate with the study of (Ashiq & Warraich, 2024), who urged that investing in necessary tools for data competency skills is a crucial factor that further hinders librarian skills. The present study underscores that the majority of the librarians in academic libraries are not fully aware of the importance of data literacy(Ihsan et al., 2025). The study also highlights the need for targeted capacity building and advocacy among academic librarians within

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academic institutions(Kamal et al., 2025). The study also emphasizes that librarians in academic libraries should focus on both internal (personal competency) and external (Institutional infrastructure) aspects to build sustainable data services in an academic setting.

Furthermore, the findings underscore the urgent need to integrate data literacy training programs for library professionals in Pakistan to develop these essential competency skills. It is assumed that learning data competency skills is are imperative skill of the 21st-century libraries (S. A. Khan & Bhatti, 2017). The organization must foster a supportive culture that provides the necessary time, tools, and funding to develop data competency skills among academic librarians in Pakistan.

Conclusion

The study presents an insightful finding regarding the data competency skill of academic librarians in Islamabad. The study also highlights the current trends, future competencies, and challenges the institutions in Pakistan are facing. In the evolving landscape of data-driven research, librarians in Pakistan often lack the necessary skills. The study also highlights that librarian in Pakistan are gradually engaging in data-related activities such as data management, data analysis and visualization. The study also underscores the collaboration between research faculty and academic librarians. Despite their awareness and motivations, academic librarians in Pakistan also face numerous challenges while acquiring these skills, such as a lack of formal training, limited administrative support, outdated curricula, and a heavy workload, which hinder the librarians' data competency skills. The findings also suggest that addressing the identified gaps, including reform in LIS curricula, institutional policy support, continuous professional training, and investment in digital infrastructure, will further align librarians with the international standards and academic excellence of their research faculty. The study provides practical insights for academics, LIS educators, policymakers, and library administrators to support librarians in transitioning into data-literate professionals. Based on the findings of this study, the following recommendations are proposed:

Recommendations

The academic libraries in Islamabad should introduce accredited training programs in data literacy, digital preservation, and research data management through educational institutions and library associations, such as the Pakistan Library Association and others. The curriculum reforms have become a necessity of the time because many LIS departments offer outdated curricula that hinder library professionals from developing data competency skills. The update of LIS curricula in Pakistani universities may need to be adjusted in response to the evolving landscape of academic librarianship. Academic libraries in advanced countries provide their

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academic librarians with support; however, in developing countries like Pakistan, a significant gap exists between the administrative support available and the needs of academic librarians. Institutional support is becoming increasingly essential for data-driven competencies, so the organization must offer grants for data tools, workshops, and staff development focused on data competency skills.

In Pakistan, there is a lack of collaboration between academic departments and library staff. Collaboration between the academic department and library staff will pave the way for data competency skills for academic librarians in Islamabad. Last but not least, academic institutions, including public and private sector universities, should promote a culture of continuous learning, as without such knowledge, academic librarians cannot advance in data-driven competencies and skills. For this, library staff should consider online courses, such as webinars and conferences, on data practices.

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