

RESEARCH ARTICLE

Perception, Competencies, and Potential Challenges Towards Big Data Management among the University Libraries of Khyber Pakhtunkhwa

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Abstract: This study investigates the competencies of Library and Information Science (LIS) professionals in managing big data within university libraries in Khyber Pakhtunkhwa, Pakistan. It assesses their familiarity with big data and intentions to utilize it, aiming to enhance library services. A descriptive survey was conducted using a questionnaire to collect quantitative data from 81 LIS professionals. Data analysis involved using SPSS to generate frequencies and percentages. Research Limitation: The study is limited to university libraries in Khyber Pakhtunkhwa and may not represent competencies across regions or library settings. Results show that a majority of respondents are familiar with big data and intend to use it, highlighting their awareness of its potential to enhance library services. Practical Implications: The study guides LIS professionals in enhancing their competencies in big data management, informing professional development and strategic planning to integrate big data effectively and improve service quality. This research addresses the gap in the literature by examining the competencies of LIS professionals in managing big data in university libraries. It offers insights into utilizing big data resources, helping libraries overcome challenges, and contributing to the field of library and information science.

Keywords: Library and Information Science, LIS professionals, Big Data Management, University Libraries, Competencies, Pakistan, Practical Implications, Service Quality

Introduction

The term "big data" is often used to refer to vast amounts of organized and unstructured data that is infeasible to handle using conventional database management systems and programs (Ammu & Irfanuddin, 2013). Ali (2015) also defines big data as an evolving term that describes any voluminous amount of structured, semistructured and unstructured data that has the potential to be mined for information.

According to Dumbill (2013), "Big data is data that surpasses the processing power of typical database systems." This definition is wider and more conceptual than previous ones. Data is too large, dynamic, or disparate to be stored effectively in a traditional database. Big Data is an informational asset characterized by volume, speed, and variety, and it requires specific technology and analytical methods to make it valuable (De Mauro et al., 2016). By reviewing the relevant literature chronologically, we may learn about the foundations upon which big data was built. Big data's roots may be traced back to the early twentieth century and Fredrick Winslow Taylor's seminal book, "The Principles of Scientific Management" (Bumblauskaset al. 2017). Since 2011, "big data" has become more common in academic writing (Ahmed & Ameen, 2017).

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Li et al. (2019) highlight how big data underpins the current services and required data of digital libraries, and they underline the necessity to use big data techniques for service enhancement and innovation, including resource transfer and utilization. They emphasized the significance of application servers and large data resources that public technologies might exploit, such as data on user behavior and digital materials. They pointed out, for instance, that libraries may conduct a more in-depth and precise study of users' reading patterns, resource utilization behavior, and network use by analyzing user interaction material and merging it with social user information on the web.

The library community may take use of the potential presented by big data technology to move away from the massservice paradigm and toward a more individualized approach to patron care. By catering to individual patrons' needs, libraries may attract a wider range of customers and save them money on both their time and the expense of arranging the library's collection (Li et. al., 2019).

Sulistialie (2015) states that librarians manage knowledge management, retrieval, distribution, and system upkeep. However, the patterns that libraries have and utilize to carry out their functions are changing due to big data. In the library world, there are two main definitions of "big data": one focused on the data itself and another on the value of the information it contains. In data-centric definitions, "big data" refers to information with characteristics that cannot be repaired (e.g., large volume, increasing rapidly). In terms of skills-based definitions, "big data" is often referred to as the infrastructure required to process information. Combining these two definitions of big data leads to the conclusion that it is information that should be handled using mature technology in library science.

Digitization is the other task performed in libraries that focuses on large datasets. Access, preservation, collecting, development, etc., are only a few of the numerous practical advantages of digitization that Mapulanga (2013) cites. This suggests that there may be a great deal of data worth keeping that may be created throughout the digitization process. Libraries must handle large datasets as part of the digitization process; hence this inevitably leads to the birth in big data inside libraries (Zhan & Widen, 2017).

The primary goal of this research is to highlight librarians' perspectives, skills, and concerns about big data in libraries so that recommendations may be made to stakeholders whose institutions stand to gain from adopting this technology. The results of this research will help LIS professionals at the University of Khyber Pakhtunkhwa understand the importance of the characteristics of big data, such as data volume, velocity, diversity, value, and authenticity (Daniel, 2015).

Additionally, librarians who are well-versed in the latest big data trends will be better equipped to search for, manage, and analyze information, which will have a ripple effect across their respective businesses (Ahmed & Ameen, 2017).

Objectives of the Study

The following are the objectives of the study.

1. To know about the awareness level of LIS professionals towards Big Data.
2. To assess the competencies of the LIS professionals in relation to big data.

Literature Review

According to Ahmed et al. (2018), respondents identified twelve abilities as crucial to knowledge management. Skills in communication, information management, information technology, leadership, teamwork, decision-making, project management, mentorship, consensus building, change management, negotiation, and facilitation were all necessary.

In order to learn more about what makes a good librarian, Ashiq, Rehman, and Batool (2018) did an interview study. Library leaders require a wide range of competencies, including communication, interacting with peers to examine trends, foresight into how to meet the needs of patrons in the future, information

sharing, organizational understanding, and team building. "According to the survey respondents, if your library is to win back the trust of sceptics, its skilled personnel must respond to their needs in a timely manner.

According to Aslam (2018), the librarians at this library are highly qualified and experienced and have access to the most up-to-date training and technology. The survey also discovered that academic libraries faced the most novel trends and difficulties in information retrieval, storage and delivery, licensing, financial planning, and the creation of an institutional repository.

In order to better equip librarians for the challenges of the contemporary library, Cherinet (2018) performed research to highlight the skills and training they'll need in the future. Long deliberation led to the framing and division of the eleven chosen talents and future responsibilities into a number of distinct categories. These findings revealed that librarians need these abilities more than others, including stiff workmanship, moderate craftsmanship, and others. Skillsets in leadership, 21st-century craftsmanship, research methodologies, educational approaches, strategies for lifelong learning, and cultural vigilance.

The importance of data librarians was highlighted by Federer (2018), who found that they were required to aid in planning data management and promoting scholarly communication. It was also determined that data librarians need abilities such as data visualization, data service creation, connection building with researchers, professors, etc., needs assessment, oral communication, and presentation.

King investigated the qualities and skills essential for collaborative librarianship (2018). Based on the concept of a digital library established by the International Organization of Library Associations and Institutions, he detailed a few key skills for digital libraries (IFLA). These skills revolve around digitally-based information and management. This includes both user experience and research expertise, which are crucial to the work of digital library professionals. Additionally, the study identified talents linked to digital heritage librarians and digital librarians, such as the ability to work with large data, data mining methods, and programming knowledge (XML, Python, Java). In addition, librarians who specialize in digital scholarship need training in the field throughout their careers.

The competence level of LIS experts was investigated by Lanzuela (2018), and suggestions were made on how to enhance these professionals' abilities. This study used questionnaires and in-person interviews to collect data from four CICM universities. The study's authors highlight certain professional skills with regard to developing tendencies. These abilities include the capacity to administer a database, offer web services, and manage the library's website, as well as the ability to digitize library materials and access those materials online. As this study shows, attending conferences, seminars, and training programs is a common way for responders to expand their horizons and hone their craft.

Laskowski (2018) investigated the professional librarians' perceptions of library students' technical competence. According to the study's author, few library schools teach their students the fundamentals of information technology that would be valuable to them in their careers as librarians. The authors of this study stress the importance of eight core technical competencies for students. Xml, A Integrated Library (ILS), Database Administration and Curation, Assessments and Analytics, Data protection, Copyright and Support Transparent, Accessibility and User Experience, and Intellectual Content Creation and Curtain Round Out the Top 8. Much work must be done before professional librarians can claim even these minimum technology skills.

Within the context of academic libraries, Lewis (2018) investigated emerging competencies. The final report, published in 2010, examined the most important skills for modern librarians and listed many major domains of expertise, including fundamental knowledge, craftsmanship, leadership traits, contribution to research, and IT competencies.

Library professionals may benefit from Mwaniki's (2018) conceptual framework for library work in the realm of cutting-edge technologies. The study's author demonstrates that the advent of digital tools significantly affects both library workers and patrons. The study's author noted that modern librarians place a premium on ready access to lichenological materials. This work relied heavily on existing research. In the same vein, librarians will continue to play an important role in the years to come so long as they are trained in the most up-to-date information science methods.

The skills of librarians were assessed by Oyedokun et al. (2018). They were also well-versed in the use of computers, the library's IT system, the search for relevant resources, and the administration of databases. However, librarians confront difficulties at the library regarding using ICT tools due to a lack of an adequate information technology infrastructure, trained personnel, funding, reliable electricity, and thorough instruction.

In order to better serve their customers in the digital era, UIS experts are constantly expanding their knowledge base, which is exactly what Raj et al. (2018) investigated. Computer-related abilities were singled out for special attention, including typing, database creation, barcode technology, and website upkeep. Similarly, LIS workers may improve their employment prospects by honing their abilities in areas such as Connectivity, storage, administration, transmission, and accessibility of data and communications.

Top skills for exceptional librarians were outlined by Rodriguez (2018). Principal features include six attributes shared by effective librarians and coverage of five focus areas. Each of the four topics relates to the history of teamwork. Additional foci include evaluation and impact measurements, copyright and publishing services, metadata services, and institutional repositories (IRs) administration. Six individual qualities include the ability to work together, communicate well, show energy and ambition, adapt well to new situations, be reasonable, and be open to new experiences, which is "an attempt to bridge disciplines. Progress in one's career may be influenced by continuing one's education, as Yu et al. (2018) observed. Librarianship development is the core concern. For this reason, technical expertise is crucial for delivering satisfactory customer service. Consideration should also be given to novel tactics, methods, approaches, and procedures for enhancing librarian competence. By analyzing the text of many job postings, Gardiner et al. (2017) discovered several talents relevant to big data, including systems integration capabilities, programming techniques, Hadoop tech, and analytical abilities.

Using a quantitative approach, Khan and Bhatti (2017) investigated whether or not university librarians in Pakistan have the digital skills essential for creating and maintaining digital libraries. The findings demonstrate that academic librarians in Pakistan have a foundational understanding of digital skills, with private-sector academic librarians doing better than their public-sector counterparts. The study breaks down digital competence into three distinct areas: management, development, and security. Librarians have the skills necessary to create a digital library, including the ability to use a scanner, OCR software, digital library storage devices, and metadata assignment. Librarians also have the skills necessary to manage a digital library, including the ability to raise funds, manage roads and facilities, define criteria for the latest technological content, and troubleshoot technical issues. In addition, librarians in the third group are well-versed in data security (by making regular backups of digital materials) and the creation of appropriate policies and guidelines for internet users.

Knowledge management experts' knowledge was analyzed by Siddike and Islam (2011). In this investigation, we opted for the quantitative method. The majority of respondents (93%) have just a passing familiarity with management from readings in the media and have never taken a class on the topic. The data shows that 7.80% of the sample population engaged in the knowledge management workshops.

Batool and Ahmed (2010) investigated the range of technology approaches librarians overlook. The interview was systematic, with various questions answered to collect information for the study. According to the findings, the general degree of knowledge in the population may be determined. Computer technology

has recently played a prominent role among the most common kinds. A variety of IT-related questions were posed to the respondents.

Research Methodology

A quantitative research technique was employed to provide a precise description of the current condition of the phenomena. Surveys are commonly employed in quantitative research because they allow researchers to learn about the status of a topic of interest (Gay et al., 2004). The recommended strategy followed the quantitative model commonly used in the social sciences. When it comes to collecting numeric data, surveys are the gold standard (Creswell, 2003). Researchers used a survey to gather data for this study. Surveys are a useful tool for gathering information about aspects of human existence that must be preserved but are challenging to research directly.

In the analysis's situating context (Alqudsi-Ghabra & Al-Dousari, 2019), questionnaires are typically used as the primary data collection instrument in survey research designs. The LIS professionals who took part in this study came from a range of different Khyber Pakhtunkhwa university libraries, both in the public and private sectors. The research employed a quantitative strategy and descriptive survey methodology to assess the demographics, views, perceptions, competencies needed, and barriers faced by participants when dealing with big data.

This study is quantitative in nature, and the survey method was used to gather data about perception, competencies, and potential challenges to big data management among the public and private sector university libraries of Khyber Pakhtunkhwa. This method is suitable and appropriate because the population is controlled by nature and spread over a large geographic area based on the reactions of employees to big data in university libraries.

Data Analysis and Results

The respondents were asked eleven statements about the competency level of LIS professionals to handle big data (Table 1 and Table 2). The 07 statements received a mean score of around 4, indicating that the respondents were agreed about the scale importance of 'knowledge of internet search engines and web resources' (M=3.70, SD=0.961), 'database searching skills' (M=3.73, SD=1.004) 'experience of using technology' (M=3.60, SD=1.108), 'experience of electronic resources acquisitions' (M=3.53. SD1.062)'Understanding of scholarly communication, including copyright and open access' (M=3.55. SD=1.073), 'knowledge of data affixation' (M=3.52, SD=1.095) and 'understanding of subject headings and metadata tags' (M=3.60, SD=1.065). Only four statements received a mean score of around three, indicating that the respondents were uncertain about 'experience/knowledge of federated search engines' (M=3.37, SD=1.062) and 'enthusiasm for new information technologies.'

(M=3.21, SD=1.025), 'knowledge of data mining' (M=3.42, SD0.988) and 'knowledge of online cataloging (OPAC) and metadata' (M=3.46, SD=1.044).

Table 1
Awareness level of LIS professionals towards big data

S#	Question	Mean	SD
1	I am aware of scholarly communication, including copyright and open-access	3.55	1.073
2	I am aware of subject headings and metadata tags	3.60	1.065
3	I have database-searching skills	3.73	1.004
4	I am aware of data mining and data analytics techniques	3.42	0.988
5	I have knowledge of online cataloging and metadata	3.46	1.044

S#	Question	Mean	SD
6	I have knowledge of data fixation	3.52	1.095
7	I have knowledge of Internet search engines and Web resources	3.70	0.961

Scale: Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, strongly agree=5

Table 2
Respondents' competency level toward big data

S#	Question	Mean	SD
1	I have experience in using technology	3.60	1.108
2	I have experience in electronic resource acquisitions	3.53	1.062
3	I have experience/ knowledge of federated search engines	3.37	1.062
4	I have enthusiasm for new information technologies	3.21	1.025
5	I have database-searching skills	3.73	1.004
6	I have data searching, management, and data analytical skills	3.42	0.988

Discussion

This study was designed to explore the status of big data in university libraries. The study's objectives include determining big data competencies in public and private sector university libraries. The study's findings in light of the literature cited are summarized below.

Regarding the competencies level of big data, the results of the study are somewhat similar to those of the studies of Zhan and Widen (2017); Semeler, Pinto and Rozados (2017); Federer (2018) and Younas (2019) who have also reported the same results on big data competency level.

Conclusion

The result of the study concluded that respondents were competent in using big data. It shows that it has improved its working efficiency and provides better services to its readers. The challenges faced by respondents were a lack of professionals to deal with big data, insufficient finances to improve the current infrastructure to handle big data, lack of willingness to learn new technologies, authorization, and legislation regarding the protection of individual privacy,' issues related to storage and access of big data, finding the right technological talents, computational capacity for storing, analyzing and understanding the data privacy protection.

References

- Ahmed, W., & Ameen, K. (2017). Defining big data and measuring its associated trends in the field of information and library management. *Library Hi Tech News*, 34(9), 21–24. <https://doi.org/10.1108/lhtn-05-2017-0035>
- Ahmed, S., Sheikh, A., & Akram, M. (2018). Implementing knowledge management in university libraries of Punjab, Pakistan. *Information Discovery and Delivery*, 46(2), 83–94. <https://doi.org/10.1108/idd-08-2017-0065>
- Ali, I. (2015). Big data: Apa dan pengaruhnya pada perpustakaan? *Jurnal Media Pustakawan*, 22(4), 19–23. <https://ejournal.perpusnas.go.id/mp/article/view/218>
- Alqudsi-ghabra, T., & Al-Dousari, E. (2019). Graduate LIS students' attitude toward university libraries and personnel. *The International Information & Library Review*, 51(1), 9–18. <https://doi.org/10.1080/10572317.2018.1433416>
- Ammu, N., & Irfanuddin, M. (2013). Big data challenges. *International Journal of Advanced Trends in Computer Science and Engineering*, 2(1), 613–615. <https://citeseerx.ist.psu.edu/document>
- Ashiq, M., Ur Rehman, S., & Batool, S. H. (2018). Academic library leaders' challenges, difficulties and skills: An analysis of common experiences. *Libri*, 68(4), 301–313. <https://doi.org/10.1515/libri-2018-0063>
- Aslam, M. (2018). Perceptions of leadership and skills development in academic libraries. *Library Philosophy and Practice*, 0_1. <http://arit.npru.ac.th/en/system/>
- Attebury, R. (2018). The role of administrators in professional development: Considerations for facilitating learning among academic librarians. *Journal of Library Administration*, 58(5), 407–433. <https://doi.org/10.1080/01930826.2018.1468190>
- Batool, S. H., & Ameen, K. (2010). Status of technological competencies: a case study of university librarians. *Library Philosophy and Practice*, p. 1. <https://digitalcommons.unl.edu/libphilprac/466/>
- Bumblauskas, D., Nold, H., Bumblauskas, P., & Igou, A. (2017). Big data analytics: transforming data to action. *Business Process Management Journal*, 23(3), 703–720. <https://doi.org/10.1108/bpmj-03-2016-0056>
- Cherinet, Y. M. (2018). Blended skills and future roles of librarians. *Library Management*, 39(1/2), 93–105. <https://doi.org/10.1108/lm-02-2017-0015>
- Creswell, J. W., Clark, V. L. P., Gutmann, M. L., & Hanson, W. E. (2003). Advanced mixed. *Handbook of Mixed Methods in Social & Behavioral Research*, 209, 209–240.
- Daniel, B. (2015). Big Data and analytics in higher education: Opportunities and challenges: The Value of Big Data in Higher Education. *British Journal of Educational Technology: Journal of the Council for Educational Technology*, 46(5), 904–920. <https://doi.org/10.1111/bjet.12230>
- De Mauro, A., Greco, M., & Grimaldi, M. (2015, February). What is big data? A consensual definition and a review of key research topics. In *AIP conference proceedings* (Vol. 1644, No. 1, pp. 97–104). American Institute of Physics. <https://doi.org/10.1063/1.4907823>
- Dumbill, E. (2013). A revolution that will transform how we live, work, and think: An interview with the authors of big data. *Big Data*, 1(2), 73–77. <https://doi.org/10.1089/big.2013.0016>
- Federer, L. (2018). Defining data librarianship: a survey of competencies, skills, and training. *Journal of the Medical Library Association: JMLA*, 106(3), 294–303. <https://doi.org/10.5195/jmla.2018.306>
- Gardiner, A., Aasheim, C., Rutner, P., & Williams, S. (2018). Skill requirements in big data: A content analysis of job advertisements. *Journal of Computer Information Systems*, 58(4), 374–384. <https://doi.org/10.1080/08874417.2017.1289354>
- Khan, S. A., & Bhatti, R. (2017). Digital competencies for developing and managing digital libraries: An investigation from university librarians in Pakistan. *Electronic Library*, 35(3), 573–597. <https://doi.org/10.1108/el-06-2016-0133>

- King, M. (2018). Digital Scholarship Librarian: What Skills and Competences are Needed to be a Collaborative Librarian. *The International Information & Library Review*, 50(1), 40–46. <https://doi.org/10.1080/10572317.2017.1422898>
- Koloniari, M., & Fassoulis, K. (2017). Knowledge management perceptions in academic libraries. *Journal of Academic Librarianship*, 43(2), 135–142. <https://doi.org/10.1016/j.acalib.2016.11.006>
- Lanzuela, F. G. (2018). Competencies of librarians in CICM higher education institutions: Towards A proposed capacity building and continuing professional development plan. *Research Journal of Library and Information Science*, 2(3), 29–52. <https://doi.org/10.22259/2637-5915.0203004>
- Laskowski, C. (2018). Reaching the baseline: A professional's perspective on technological competencies for library students. In *LIS Scholarship Archive*. <https://doi.org/10.31229/osf.io/mz42b>
- Lewis, V. (2018). New Skills for the Academic Library Workforce—A Canadian Experience.
- Li, Y., Huang, C., Ding, L., Li, Z., Pan, Y., & Gao, X. (2019). Deep learning in bioinformatics: Introduction, application, and perspective in the big data era. *Methods (San Diego, Calif.)*, pp. 166, 4–21. <https://doi.org/10.1016/j.ymeth.2019.04.008>
- Little, G. (2012). Managing the data deluge. *Journal of Academic Librarianship*, 38(5), 263–264. <https://doi.org/10.1016/j.acalib.2012.07.005>
- Mapulanga, P. (2013). Digitizing library resources and building digital repositories in the University of Malawi Libraries. *Electronic Library*, 31(5), 635–647. <https://doi.org/10.1108/el-02-2012-0019>
- Mwaniki, P. W. (2018). Envisioning the future role of librarians: skills, services and information resources. *Library Management*, 39(1/2), 2–11. <https://doi.org/10.1108/lm-01-2017-0001>
- Oyedokun, T. T., Oyewumi, F. A., & Laaro, D. M. (2018). PERCEPTION AND ATTITUDE OF LIBRARY AND INFORMATION SCIENCE PROFESSIONALS TOWARDS KNOWLEDGE MANAGEMENT: A SURVEY OF CERTIFIED LIBRARIANS IN NIGERIA. *Library Philosophy & Practice*.
- Rodriguez, M. (2018). NASIG core competencies for scholarly communication librarians. *Technical Services Quarterly*, 35(3), 306–308. <https://doi.org/10.1080/07317131.2018.1456869>
- Siddike, M. A. K., & Islam, M. S. (2011). Exploring the competencies of information professionals for knowledge management in the information institutions of Bangladesh. *The International Information & Library Review*, 43(3), 130–136. <https://doi.org/10.1080/10572317.2011.10762890>
- Sulistialie, E. (2015). New roles for the librarian of Bosscha Observatory: Review of tasks in library over two decades. *Open Science at the Frontiers of Librarianship*, 492, 232. <https://adsabs.harvard.edu/full/2015ASPC..492..232S>
- Yu, K., Gong, R., Jiang, C., Hu, S., Sun, L., & Luo, Y. Z. (2018). A study on the effect of continuing education with digital technology on professional growth and job satisfaction of librarians. *Eurasia Journal of Mathematics Science and Technology Education*, 14(7), 3285–3292. <https://doi.org/10.29333/ejmste/91247>
- Zhan, M., & Widén, G. (2019). Understanding big data in librarianship. *Journal of Librarianship and Information Science*, 51(2), 561–576. <https://doi.org/10.1177/0961000617742451>