



Big Data Analytics for Decision-Making in Academic Libraries

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Abstract: This research looked at how big data analytics is incorporated into Academic libraries' decision-making processes, with a focus on how it may improve evidence-based management, service delivery, and strategic planning. The study used a mixed-method approach to support a descriptive and analytical research design and was carried out among Academic libraries in Chennai, India. Using structured questionnaires and pertinent secondary sources, information was gathered from 120 library professionals employed at Academic, deemed institutions, and affiliated colleges. The results showed that library professionals had a moderate to high level of understanding of big data analytics, with circulation data, user attendance records, and electronic resource consumption statistics being important data sources. Major decision-making domains including budget allocation, user service enhancement, subscription administration, and collection creation were greatly aided by big data analytics. Notwithstanding these advantages, obstacles such a lack of technical expertise, poor infrastructure, a lack of funding, and worries about data security and privacy made adoption difficult. All things considered, the research demonstrated the increasing significance of big data analytics as a tactical instrument for enhancing decision quality and coordinating academic library services with user requirements and institutional goals.

Keywords: Big Data Analytics, Decision-Making, Academic Libraries, Library Services, Digital Transformation

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INTRODUCTION

The intellectual underpinning that supports teaching, learning, research, and innovation is provided by Academic libraries in India. These libraries play a crucial role in India's higher education institutions. They enhance the academic climate of institutions, make intellectual communication easier, and enable access to many digital and paper materials. Library operations decision-making that is both well-informed and timely is crucial to the success of these tasks. Decision-making is thus an essential managerial duty in Indian university libraries, necessitating thorough analysis of problems, evaluation of potential solutions, and implementation of a plan that strikes a balance between the demands of administrators, students, faculty, and researchers with the available resources. [1]

Decisions made by libraries in modern India's higher education system are heavily reliant on data. Data pertaining to use, access patterns, and user behavior has been produced in huge quantities by the proliferation of digital learning platforms, the dependence on electronic resources, and the fast rise in student enrollment. This has led to an increase in the expectation that librarians would make choices about collection growth, service improvement, technology adoption, and policy formation based on quantitative and qualitative data. To improve operational efficiency and ensure that library services match with institutional aims and national educational aspirations in India, data-driven decision-making is crucial, according to many researchers. [2][3]

The incorporation of data analytics, stakeholder involvement, technical review, and strategic planning are all factors that contribute to the modern decision-making process in Indian university libraries. EBDM, which stands for evidence-based decision-making, is a method that combines statistical data, professional experience, and user input. It has emerged as a significant strategy for enhancing library services and boosting user happiness. [4] It is possible for libraries to systematically evaluate the effectiveness of their services, identify areas of weakness, and put into action enhancements that are in response to the shifting expectations of academic communities by using EBDM. Additionally, this method provides support for accountability and quality assurance, both of which are being increasingly stressed in the policies and accrediting frameworks being implemented in Indian higher education. [5]

The decision-making horizons of Indian libraries have been greatly widened by recent technological developments and digital transformation programs. A notable impact on library operations has been the rise of big data, which is defined by datasets that are enormous, diversified, and created quickly. For successful interpretation of data produced via ILLs, electronic resource platforms, institutional repositories, and SLNs, sophisticated analytical tools are required. [7] Indian university libraries have been able to enhance their services, make better use of their resources, and prepare for the future thanks to the insights derived from the increasing use of analytics, automation, and artificial intelligence. [8]

The field of data librarianship is booming in popularity in India's higher education institutions as library collections become more tech-driven hubs of information. The value and relevance of library services are being enhanced, and professionals in the field are increasingly required to acquire skills in data analysis, data management, and digital technology. [9] There has been inconsistent adoption of big data analytics throughout university libraries in India, despite several studies demonstrating its promise for better decision-making and user-centric services. Persistent problems include a lack of thorough data governance regulations, insufficient funding, a lack of training opportunities, and an outdated digital infrastructure. [10] This research highlights the need of using big data analytics in Academic library decision-making in India to improve service delivery, make better use of resources, and encourage academic achievement in India's higher education system. [11]

OBJECTIVES

- To examine the role of big data analytics in improving decision-making processes in academic libraries.
- To identify key areas of library management (collection development, user services, and resource utilization) where big data analytics is effectively applied.
- To analyze the challenges and opportunities associated with implementing big data analytics in academic libraries.

RESEARCH METHODOLOGY

Research Design

The study looked at how big data analytics may help Academic libraries make decisions using a descriptive and analytical research approach. The researcher was able to summarize current procedures while examining trends, patterns, and connections pertaining to data driven decision-making thanks to this

methodology. The study used a mixed-method approach, combining qualitative insights to comprehend perceptions, difficulties, and strategic value with quantitative data to quantify use trends. This methodology guaranteed a thorough and impartial comprehension of the integration of big data analytics into academic library operations.

Study Area

The study was carried out at academic libraries in Chennai, one of India's most important centers for research and education. Numerous universities, deemed universities, and associated institutions with differing degrees of technology adoption in library services might be found in Chennai. This variety made the study area appropriate for analyzing current trends in academic library decision-making as it allowed the researcher to gather various viewpoints and practices about the application of big data analytics.

Sample Design and Sample Size

The study population consisted of library professionals working in Academic libraries, deemed universities, and affiliated college libraries in Chennai. The researcher employed a purposive sampling technique to select respondents who possessed relevant knowledge of digital library systems, electronic resources, and data management practices. The researcher selected a total of 120 library professionals as the sample size, as this number adequately represented diverse institutional contexts and professional roles while remaining manageable for detailed analysis. This sample size strengthened the reliability and representativeness of the findings.

Data Collection

A structured questionnaire created specially to collect data on the use of big data analytics in academic libraries was used by the researcher to obtain primary data. A small number of open-ended questions were included in the survey to gather qualitative viewpoints and professional experiences, whereas closed-ended questions were used to enable quantitative assessment. The tool addressed important topics such data kinds, analytical methods employed, decision-making areas impacted, and difficulties faced. To supplement and contextualize the main data, the researcher also gathered secondary data from published research publications, books, conference proceedings, institutional reports, and reputable library and information science resources.

Data Analysis

To properly describe and understand the replies, the researcher evaluated the quantitative data using descriptive statistical approaches including percentages, means, and frequencies. Tables and charts helped the researcher make her findings more understandable. The researcher used content analysis to find patterns and themes in the qualitative data that came from the open-ended questions. The researcher properly concluded that academic libraries may benefit from big data analytics in terms of more informed and strategic decision-making by combining quantitative and qualitative data.

RESULTS

Table 1: Demographic Profile of Respondents

Category	Variables	Frequency (n = 120)	Percentage (%)
Gender	Male	72	60.0
	Female	48	40.0
Type of Institution	University Library	54	45.0
	College Library	46	38.3
	Deemed/Autonomous Institution	20	16.7
Work Experience	Below 5 years	32	26.7
	5–10 years	49	40.8
	Above 10 years	39	32.5

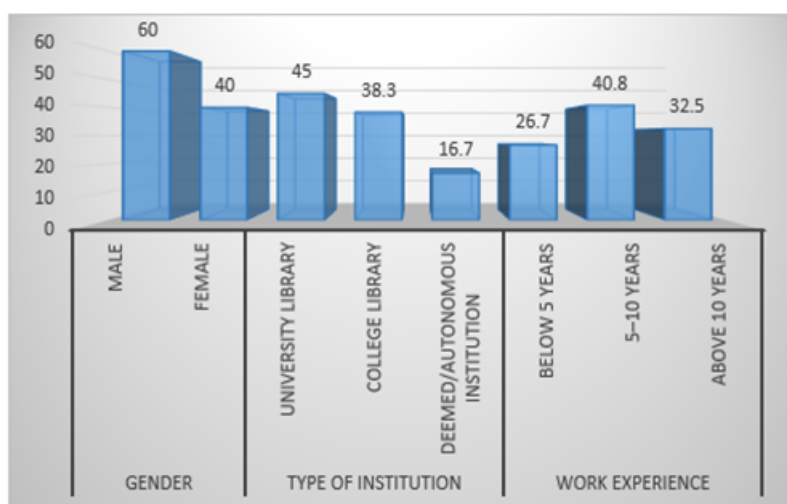


Figure 1: Demographic Profile of Respondents

Gender, institution type, and years of experience are some of the responder demographics summarized in the table and figure. There are somewhat more male replies than female ones, but both sexes contributed significantly, suggesting a balanced gender representation that lends credibility to the results. The majority of respondents are employed by academic libraries, which is in line with the study's objectives and guarantees that the data is representative of the academic library setting. Many respondents have been in their current positions for over five years, which bodes well for the validity of their views since they are

based on first-hand experience and participation in library operations and decision-making. Results are more reliable and relevant since the research is based on the experiences of varied and experienced library workers, as seen in the demographic profile.

Table 2: Awareness Level of Big Data Analytics among Library Professionals

Awareness Level	Frequency	Percentage (%)
High awareness	44	36.7
Moderate awareness	56	46.6
Low awareness	20	16.7

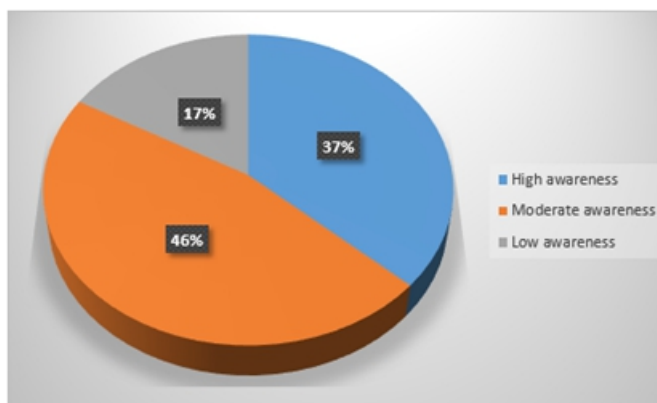


Figure 2: Awareness Level of Big Data Analytics among Library Professionals

The figure and table show how well-informed academic library staff are about big data analytics. Big data analytics is becoming more important in academic libraries, since the majority of respondents had a moderate to high understanding of the topic. All signs point to librarians seeing big data as a tool to enhance library operations and inform decision-making. Even while the percentage of respondents with poor awareness is tiny, it shows that some professionals still don't know enough about big data or haven't had enough experience with it. Possible causes of this disparity include insufficient training opportunities, restricted access to necessary technology, or a lack of organizational backing for analytics projects. The results show that people are becoming more aware of the importance of academic libraries' use of big data analytics, but they also highlight the need for programs to increase faculty and staff capacity, as well as opportunities for ongoing professional development. Table 2 shows that increasing people's familiarity with big data analytics is critical for its successful implementation in university libraries.

Table 3: Types of Data Used for Analytics in Academic Libraries

Type of Data	Frequency*	Percentage (%)
Usage statistics (e-resources)	98	81.7
User attendance/footfall data	76	63.3
Circulation data	69	57.5
Institutional repository data	54	45.0
Social media/user feedback data	41	34.2

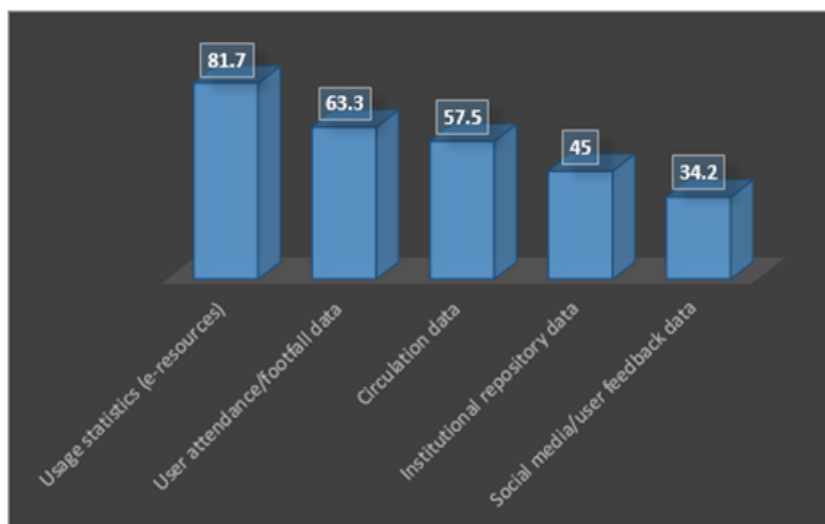


Figure 3: Types of Data Used for Analytics in Academic Libraries

The many kinds of data sources used by academic libraries for analytics are shown in the table and image. Based on the results, the most popular data source is information on how resources are used online, followed by records of user attendance and circulation data. Academic libraries depend significantly on data that is both organized and created by the system; this data is easily accessible via digital library systems and management software. Libraries are clearly shifting their attention to digital resources and online services, as seen by the prevalence of electronic resource consumption statistics. This reflects the continuous move toward digital information access and user interaction. However, social media comments and data from institutional repositories are underutilized, suggesting that analytics are still missing opportunities for unstructured and user-generated data. The absence of data mining expertise, insufficient regulations for collecting and storing unstructured data, or insufficient tools for evaluating this kind of data might be to blame. It seems from the data in the table that academic libraries are making use of the data they have at their disposal for decision-making, but that there is room for improvement in terms of data diversity and the number of sources used for analytics and user activity tracking.

Table 4: Areas of Decision-Making Supported by Big Data Analytics

Decision-Making Area	Frequency	Percentage (%)
Collection development	92	76.7
Subscription renewal/cancellation	85	70.8
User service improvement	68	56.7
Budget allocation	61	50.8
Space and infrastructure planning	44	36.7

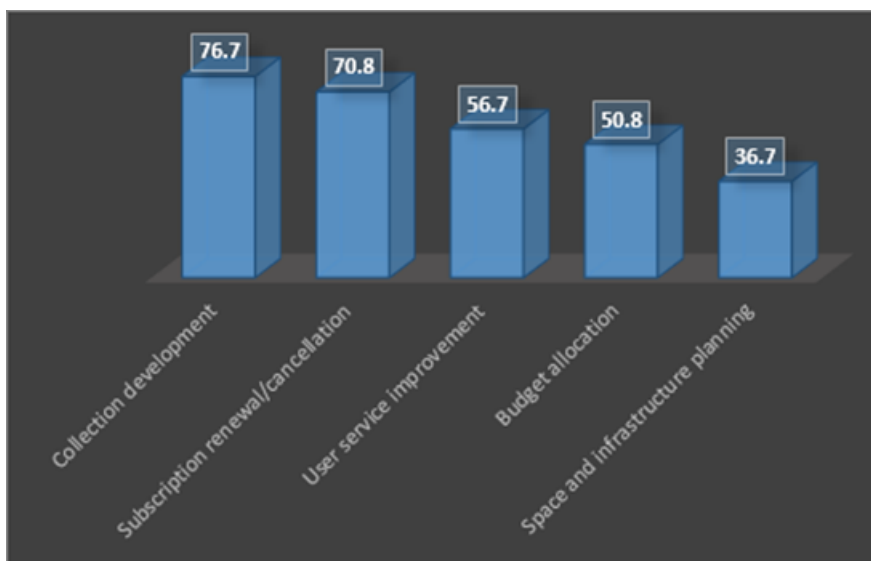


Figure 4: Areas of Decision-Making Supported by Big Data Analytics

Academic libraries use big data analytics for decision-making in the domains shown in the table and image. Optimal resource allocation and value for money may be achieved via the strategic significance of data, which the findings show is most strongly supported by analytics in collection creation and subscription management. Libraries may improve their cost-effectiveness and better satisfy user demands by using analytics in these areas to make evidence-based choices about subscription selection, renewal, and cancellation. Libraries are using data to make better financial choices, simplify operations, and improve service quality via analytics, which also helps with user services and budget allocation. Nevertheless, the findings also indicate that analytics might be used more broadly in other domains, such outreach campaigns, staff training, and infrastructure development. This suggests that not all library functions have fully taken use of big data analytics, even if it is being employed in important decision areas. Table 4

shows that academic libraries are increasingly using big data analytics to back both strategic and operational choices. It also shows that there needs to be greater adoption of big data analytics across different departments.

Table 5: Benefits of Big Data Analytics in Academic Libraries

Perceived Benefit	Frequency	Percentage (%)
Improved quality of decisions	94	78.3
Better understanding of user needs	87	72.5
Optimal utilization of resources	79	65.8
Cost reduction	62	51.7
Enhanced service efficiency	69	57.5

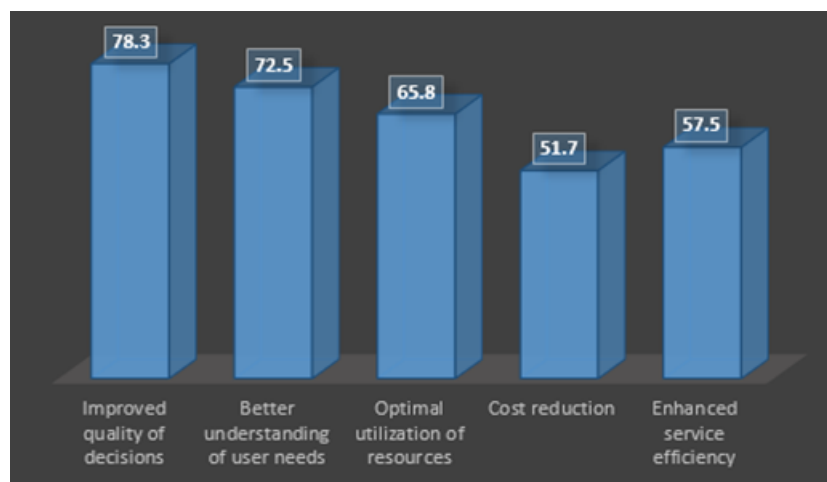


Figure 5: Benefits of Big Data Analytics in Academic Libraries

The table and image demonstrate the advantages that academic libraries believe big data analytics to have. The majority of respondents think that libraries can improve service delivery and customer satisfaction by using big data analytics to make better decisions and better understand user requirements. Accordingly, analytics seems to play a key role in empowering libraries to make choices based on evidence that are more suited to user tastes and organizational objectives. Big data analytics helps improve operational performance and decrease resource waste, while respondents also mentioned advantages including optimum resource use, cost savings, and better service efficiency. Analytics help with strategic planning by revealing trends in library use, demand for resources, and service performance; this, in turn, allows libraries to better allocate resources and boost productivity. In summary, academic libraries may greatly benefit

from big data analytics, as shown in Table 5, via improved resource management, data-driven decision-making, and service quality.

Table 6: Challenges in Implementing Big Data Analytics

Challenge	Frequency	Percentage (%)
Lack of technical skills	88	73.3
Inadequate infrastructure	74	61.7
Data privacy and security issues	66	55.0
Limited financial support	71	59.2
Resistance to change	43	35.8

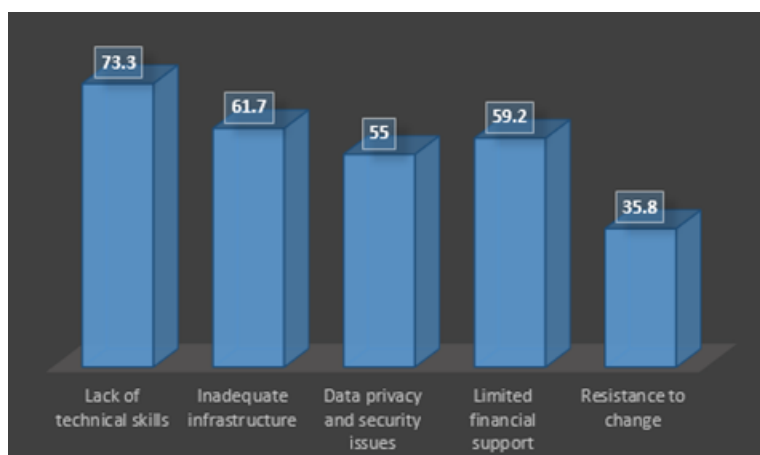


Figure 6: Challenges in Implementing Big Data Analytics

The main obstacles that academic libraries have when trying to use big data analytics are highlighted in the table and figure. Many libraries may not have the knowledge or resources to make good use of big data systems and technologies, as the results reveal that insufficient infrastructure and a lack of technical abilities are the biggest obstacles. Limited financing makes these problems worse since it prevents investments in analytics-related technology, training, and digital infrastructure. Furthermore, libraries may be wary of using analytics owing to worries around the security and privacy of user data and the need to comply with ethical standards. Staff reluctance to embrace new technology or doubts about analytics' worth are examples of organizational hurdles that are exacerbated by the existence of resistance to change. In summary, Table 6 highlights that academic libraries face various obstacles to adopting big data analytics, which necessitate strategic interventions such as capacity building, improved infrastructure, and the

creation of data governance policies and guidelines. This is despite the widely acknowledged benefits of big data analytics. For academic libraries to effectively deploy and reap the advantages of big data analytics, it is crucial to address these issues.

DISCUSSION

According to the study's results, big data analytics is becoming more widely acknowledged as a vital instrument for improving academic library decision-making by facilitating evidence based practices in domains including strategic planning, resource management, and service enhancement. According to recent studies, data analytics helps Academic libraries undergo digital transformation by enabling well-informed decisions regarding resource allocation, operational procedures, and service efficiency through the methodical analysis of institutional and usage data. This enhances library performance and user satisfaction. Systematic reviews of the literature also show how the use of big data in libraries affects professional growth, decision-making, and service improvement. They also point out enduring issues with infrastructure, technical expertise, and data governance that call for focused interventions like policy frameworks and training. [12] Empirical research in a variety of settings, such as Academic libraries in Tanzania, highlights the use of big data analytics technologies to extract insights from intricate datasets that guide strategic choices and enhance library services. [13] Furthermore, research from Bangladesh shows that big data greatly improves resource accessibility and user-centric decision-making, changing conventional library operations into more flexible and user-focused models. [14] When taken as a whole, these studies show that while big data analytics has significant promise for evidence-based decision-making in academic libraries, institutional preparedness, technological proficiency, and supporting infrastructures are necessary for its successful adoption.

CONCLUSION

The study comes to the conclusion that big data analytics, which offers significant advantages in terms of better decision quality, effective resource utilization, cost reduction, and improved understanding of user behavior, has emerged as a crucial enabler of strategic and informed decision-making in academic libraries. Even while academic libraries are using analytics more and more in their key operating areas, ongoing issues with skills shortages, infrastructure restrictions, budgetary limits, and data governance concerns prevent big data from reaching its full potential. Sustainable adoption depends on addressing these issues via focused capacity-building initiatives, investments in digital infrastructure, encouraging legislation, and a strong commitment from the leadership. All things considered, the successful use of big data analytics may make academic libraries more adaptable, user-focused, and strategically oriented establishments that can assist research, teaching, and learning in an increasingly data-intensive academic setting.

References

1. Hayes, R.M. (2021). Library Decision-making Contexts. Hayes, R.M. (Ed.). Models for library management, decision making and planning. Library and Information Science, Vol. 01, Emerald Group Publishing Limited, Leeds, pp. 3157. [https://doi.org/10.1108/S18760562\(2001\)0000001003](https://doi.org/10.1108/S18760562(2001)0000001003)
2. Tucker, S. (2020). Data analytics and evidence-based decision-making in academic libraries. The

Journal of Academic Librarianship, 46(5), 102232.

3. Lateef, E.B., Ozonuwe, O.S. & Abayomi, A.O. (2024). Users' perception and satisfaction with library facilities, resources and services in Crawford University, Nigeria. *Journal of Library Services and Technologies*, 6(1), 135 – 147. DOI: <http://doi.org/10.47524/jlst.v6i1.136>
4. Martinez, P., Gomez, A., & Liu, Y. (2022). Collaborative approaches to library decision-making. *Library Management*, 43(8/9), 567580.
5. Nguyen, T. (2023). Open access and its impact on library collection strategies. *College & Research Libraries*, 84(1), 3650.
6. Khan, M., & Du, Y. (2018). Big Data and academic libraries: A framework for implementation. *Library Hi Tech*, 36(2), 344-359.
7. Tella, A. (2021b). Awareness and perception of Big Data analytics among library professionals in Africa. *African Journal of Library, Archives & Information Science*, 31(2), 129–144.
8. Abu-Salihi, B., Wongthongtham, P., Zhu, D., Chan, K.Y.& Rudra, A. (2021). Introduction to big data technology. In *social big data analytics* (pp. 15-59). Springer, Singapore. <https://arxiv.org>pdf>
9. Ajani, F.O., Olarongbe, S.A., Sulyman, A.S. & Isiaka, A.O. (2024). Harnessing data librarianship for big data in academic libraries. *Middlebelt Journal of Library and Information Science*, 22, 48 – 59.
10. Tella, A. (2021a). The role of Big Data in modern academic libraries: Challenges and future directions. *Library Review*, 70(4), 250-267.
11. Pradhan, A. S., & Hiray, S. R. (2021). Application of big data techniques for efficient web-based library services using big data: A modern approach (pp. 58–77). IGI Global. <https://doi.org/10.4018/9781799830498.CH005>
12. Shahzad, K., & Khan, S. A. (2024). Factors influencing the adoption of big data in libraries: a systematic literature review of peer-reviewed articles from 2013 to 2023. *The Electronic Library*, 42(5), 722-740.
13. Ponera, J. M., & Kyumana, V. (2024). Big data analytic tools usage among academic libraries in Tanzania.
14. Rahman, H., Ghazali, A. M., & Sawal, M. Z. H. M. (2025). The impact of big data on university libraries in Bangladesh. *IFLA journal*, 51(1), 147-163.