Leveraging Big Data Analytics in Nigerian University Libraries: Perceptions, Competency, And Usage Among Librarians in Osun State

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Abstract- ***This paper investigates the perceptions, competency, and usage of Big Data Analytics (BDA) among librarians in Nigerian university libraries, focusing on Osun State. The study employed a mixed-methods approach involving 36 librarians selected from three universities representing federal, state, and private institutions. Quantitative data were collected using structured questionnaires, and qualitative insights were gathered through interviews with chief librarians. The findings revealed that the majority of librarians exhibited high levels of awareness and positive perceptions towards BDA. Competency in conducting BDA was generally high, though usage varied across institutions. The study recommends capacity building, infrastructure development, and policy frameworks to enhance BDA adoption in university libraries. The implications for practice include improved user-centered services, data-driven decision-making, and enhanced resource management.***

Indexed Terms- ***Awareness, Big Data Analytics, Competency, Perception, University Libraries***

I. INTRODUCTION

Information and communication technology advancements have revolutionized how libraries collect, manage, and analyze data. Although these technologies have generated many new opportunities and added variety in the form of data sources, publishing platforms, storage, conservation, and retrieval methods, they have also presented researchers and academic libraries with several obstacles and difficulties. Big Data Analytics (BDA) offers university libraries an opportunity to improve service delivery, increase positive user experiences and enhance resource allocation. Globally, libraries have adopted BDA to track user behavior, manage digital collections, and evaluate service outcomes (Gardner et al., 2018; Sun et al., 2018). In Nigeria, however, the adoption of BDA remains underexplored, especially within university libraries. Osun State, home to a diversity of university types, presents a unique setting for assessing librarians' readiness to embrace BDA

Big data in the context of libraries involves gathering and analyzing large volumes of user-generated and operational data to improve decision-making. Tools such as Hadoop, Spark, Tableau, and Microsoft HDInsight are widely used to process these data. With the rise in digital services and online academic resources, university libraries must modernize their data strategies. To ensure librarians can effectively use and manage big data analytics; they should receive training in data science, statistical analysis, and data visualisation.

He et al. (2018) identified potential advantages of employing big-data analytics, such as enhancing library operations, increasing collection development and management, and enhancing the user experience. They are increasingly interested in using big data to develop data-driven services, such as personalising library services and improving access to information. As the technology becomes more accessible and user-friendly, librarians are becoming more confident in their ability to efficiently make use of big-data analytics to improve library services. Although librarians are optimistic about the possible advantages of big data analytics, there are also challenges associated with implementation. According to He et al. (2018), the most common challenges reported by librarians include the lack of

knowledge, limited resources, and inadequate support from library administration. Librarians cite privacy and ethical concerns as potential barriers to effective implementation. Despite these challenges, He et al. (2018) suggested that librarians are displaying a growing interest in employing BDA to improve library operations and services.

The study addresses four core questions: (1) What is the level of awareness of BDA tools among librarians? (2) What are their perceptions toward BDA? (3) What is their competency in using BDA tools? (4) To what extent is BDA being applied in library operations?

II. LITERATURE REVIEW

2.1 Theoretical and Conceptual Framework

The study employed the Unified Theory of Acceptance and Use of Technology (UTAUT), the Information Seeking and Use (ISU) Model, and Innovation Diffusion Theory (IDT). UTAUT explains librarians' technology adoption by looking at performance and expectancy, social stimulus, and enabling environment. Venkatesh et al. (2003) emphasized the need for institutional support and perceived ease of use for successful adoption. The ISU model emphasizes individual differences in motivation, skills, and knowledge as critical to information behavior (Kuhlthau, 2004). IDT (Rogers, 2003) provides insight into how innovations like BDA spread through knowledge, persuasion, decision, implementation, and confirmation stages.

Conceptually, BDA involves collecting and analyzing large data sets to uncover patterns and support decision-making. In library science, BDA facilitates user behavior tracking, resource optimization, and improved service delivery. Tools such as Microsoft HDInsight, Tableau, R, and Python enable visualization and in-depth analysis. By leveraging BDA, libraries can enhance digital lending, personalize services, and allocate budgets more effectively (Ahmed et al., 2017).

BDA supports the integration of traditional and digital library services by generating actionable insights into collection usage, user feedback, and operational efficiency. For instance, libraries can employ analytics for forecasting demand for certain genres or identify peak periods for digital resource access. Understanding how users interact with e-journals, databases, and institutional repositories enables better content curation and service delivery.

2.2 Concept of Big Data

Big Data refers to data collections characterized by value, variety, velocity, veracity, and volume. In libraries, BDA enables data-driven decision-making, supports user experience enhancement, and informs strategic planning. Big data sets are characterized by their enormous size, complexity, and speed of generation, exceeding the capabilities of traditional data processing tools (Borah, 2019).

In the last few years, the concept of big data has become popular and attracted significant attention, driven by advancements in technological development and the exponential growth of data generated from digital sources (Botelho & Bigelow, 2023). Research by Gardner et al. (2018) and Sun et al. (2018) emphasized the growing role of BDA in libraries worldwide.

According to Ahmed et al. (2017), many librarians acknowledge BDA’s benefits but lack formal training. Studies by Shahid and Siddiqui (2021) found that even where awareness is high, adoption remains low due to institutional barriers.

2.3 Library and Big Data Analytics

The adoption of information technology methods in library management and services has been largely beneficial to the growth of academic libraries in Nigeria. This is especially helpful due to the dimensions of university libraries and the extensive volume of books they accommodate, which can make managing them difficult. To address this challenge, big data technology should be employed to create and enhance data management systems in university libraries (Li et al., 2019).

In the previous library service model, the expectations and requirements of librarians and staff were considerably elevated, and a small mistake could lead to misplacement of books, which would make readers unable to find the books they were looking for, thus reducing the library's service quality and efficiency, which makes it important to make use

of the latest technology and data and create an innovative library service model (Jia, 2019).

2.4 Librarians and Big Data

Librarians have been managing information for centuries, but the advent of big data has taken the librarian's role to a whole new level.

Big data has changed the role of librarians from simply collecting and organising information to being able to analyse and interpret data. This requires librarians to develop a deep understanding of data structures, algorithms, and programming (Gonzales, 2018). They must also be able to able to curate and organise data and use the results of their data analysis to inform decision-making (Gonzales, 2018).

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Researches however indicate that librarians might face challenges due to a lack of essential skills and competencies required for the effective utilization of big data analytics tools (Kumar & Ramesh, 2018; Li & Li, 2019).

III. METHODOLOGY

3.1 Research Design

This study employed convergent parallel design, combining qualitative and quantitative data collection procedures, and thereby adopting mixed-methods research design. It utilized survey quantitative data collection and qualitative data was collected using interviews. This approach enabled comprehensive insight into both measurable and contextual aspects of BDA adoption.

3.2 Study Area, Population and Sample

The study population comprised librarians from twelve NUC-accredited universities in Osun State. Through stratified random sampling, one university was selected from each of the federal, state, and private categories. Total enumeration was used to involve all 36 librarians in the selected universities.

3.3 Instrument and Data Collection

Quantitative data were gathered using a researcher-designed questionnaire titled "Big Data Analytics Perception, Competency, and Use Questionnaire (BDAPCUQ)." The questionnaire consisted of 25 items across four constructs: awareness, perception, competency, and usage. The instrument was validated by experts in library science and educational technology and pilot-tested with a reliability coefficient of 0.86 using Cronbach's Alpha. The items were measured using a 4-point Likert scale which include "strongly disagree = 1, Disagree = 2, Agree = 3 and strongly agree."

Qualitative data were sourced from semi-structured interviews with the three chief librarians representing each selected university type. The interviews were transcribed and further analyzed. By employing thematic analysis, recurring patterns and themes were identified. Data triangulation was applied to validate the consistency of responses between the quantitative and qualitative sources.

IV. RESULTS

Awareness: 17% of librarians had very high awareness, 61% high awareness, and 22% low awareness of BDA tools. Interview data showed that most awareness came from self-training, webinars, professional conferences, and peer collaboration. Commonly cited tools included Turnitin, Microsoft Power BI, and Tableau.

Perception: 76% of librarians had a positive perception of BDA, citing its potential to improve services and support data-driven decisions. However, 24% expressed concerns about data privacy, ethical concerns, increased workload, and lack of organizational support.

Competency: 14% showed very high competency, 64% high competency, and 22% low competency in using BDA. Librarians with backgrounds in digital librarianship, ICT, or recent postgraduate education demonstrated greater proficiency. Qualitative responses revealed a demand for more hands-on training in Python, R, and data visualization software.

Usage: Only 8% of librarians reported a very high extent of BDA use, 81% high use, and 11% low use. Usage was most frequent in institutions with dedicated ICT support teams. BDA was most commonly applied in digital collection analysis, e-resource usage statistics, and reporting library metrics to management.

V. DISCUSSION

The findings reveal an encouraging level of readiness among librarians to embrace BDA, consistent with UTAUT and IDT assumptions. Positive perception and high awareness suggest a growing understanding of the potential of BDA in enhancing library operations. However, the low percentage of very high usage implies a gap between competency and practical application, possibly due to infrastructure or administrative constraints.

Shahid and Siddiqui (2021) observed similar trends in Pakistani universities where awareness did not always translate to usage. Likewise, Ahmad et al. (2020) noted that librarians often lacked access to tools despite being conceptually aware of BDA. The results from this study underscore the critical need for institutional support, including continuous training, infrastructure upgrades, and policy development.

The low usage rate among librarians, despite their high awareness and perception, supports the assertions of Oladokun et al. (2020), who identified limited resources and administrative bottlenecks as barriers in Nigeria. The alignment with previous empirical research strengthens the call for integrative efforts between LIS educators, ICT experts, and library management to implement BDA effectively.

Moreover, the practical realities of BDA adoption involve overcoming challenges such as unreliable power supply, limited broadband, lack of in-house expertise, and data quality issues. While tools exist, without proper funding and implementation structures, libraries may find it difficult to move beyond pilot efforts.

VI. IMPLICATIONS FOR POLICY AND PRACTICE

The study's implications extend to library management, LIS training institutions, and educational policymakers:

For Library Management: Libraries must prioritize digital infrastructure and allocate budgets for data analytics tools. Librarians should be encouraged to attend BDA training workshops and subscribe to analytical software.

For LIS Training Institutions: BDA competencies should be embedded in library science curricula, including practical sessions on R, Python, Power BI, and Tableau. Certification programs and elective courses on analytics can boost employability.

For Policymakers: Guidelines and frameworks must be developed to standardize BDA use in academic libraries while safeguarding user data privacy and ethical concerns. National digital library policies should include provisions for analytics governance and cross-institutional collaboration.

VII. CONCLUSION AND RECOMMENDATIONS

This study concludes that while librarians in Osun State have high levels of awareness and favorable perceptions of BDA, actual usage remains low due to institutional, infrastructural, and technical limitations. Competency levels are generally moderate, with gaps in advanced data analysis and interpretation.

To promote the adoption of BDA in Nigerian academic libraries, stakeholders must invest in infrastructure, capacity building, and policy development. The future of librarianship in Nigeria lies in its ability to harness the power of data for improved decision-making, service innovation, and academic excellence. The following and therefore recommended:

1. Organize continuous professional development workshops focusing on BDA tools and techniques such as Tableau, R, and Python.
2. Provide investment in modern computing infrastructure to facilitate efficient data processing.
3. Develop and implement national and institutional policies guiding BDA use in libraries, with clear data governance frameworks.
4. Integrate BDA and data ethics into the curriculum of LIS education programs to prepare future-ready librarians.
5. Foster partnerships between libraries and IT departments for technical support and innovation.

6. Promote inter-institutional research collaborations that share BDA practices, tools, and challenges.
7. Encourage open-access publishing of BDA case studies in Nigerian libraries to grow local best practices.

REFERENCES

[1] Ahmad, K., JianMing, Z., & Rafi, M. (2020). Librarian's perspective for the implementation of big data analytics in libraries on the bases of lean-startup model. Digital Library Perspectives, 36(1), 21–37. https://doi.org/10.1108/dlp-04-2019-0016

[2] Ahmed, F., Ismail, K., & Ali, A. (2017). Librarians' perceptions and application of big data analytics in library management practices. International Journal of Library and Information Science, 9(3), 24–31.

[3] Borah, P. (2019, August 23). What is big data? - GeeksforGeeks. Retrieved January 7, 2023, from https://www.geeksforgeeks.org/what-is-big-data/

[4] Botelho, B., & Bigelow, S. J. (2023). The ultimate guide to big data for businesses. Retrieved February 11, 2023, from https://www.techtarget.com/searchdata management/definition/big-data

[5] Gardner, S., Geller, L., & Westra, B. (2018). Data-driven decision-making in libraries: Leveraging data to inform library practices. USA: Routledge.

[6] Gonzales, F. (2018). What is a librarian's role in big data? Retrieved July 21, 2022, from https://www.thoughtco.com/what-is-a-librarians-role-in-big-data-4471142

[7] He, M., Chiang, C., & Chiang, Y. (2018). Exploring the potential of big data analytics in library services: A Survey of Academic Librarians. International Journal of Information Management, 38(4), 518–527.

[8] Jia, A. (2019). Comparative study of resource and service needs of international students at an academic library. The Southeastern Librarian, 67(1), 3–13.

[9] Kuhlthau, C. C. (2004). Seeking Meaning: a process approach to library and information services (2nd ed.). Westport, CT: Libraries Unlimited.

[10] Kumar, A., & Ramesh, A. (2018). Big data analytics in academic libraries. A Systematic Review, 36(1), 43–61.

[11] Li, S., Hao, Z., & Ding, L. (2019). Research on the application of information technology of Big Data in Chinese digital library. Library Management, 40(8), 518–531.

[12] Li, X., & Li, R. (2019). The application of big data analytics in academic libraries: Opportunities and challenges. Journal of Academic Librarianship, 45(4), 339–345.

[13] Oladokun, A. A., Oyeleke, F. A., & Adebowale, A. E. (2020). Big data analytics: Use and impact on university libraries in Southwestern Nigeria. Scientometrics, 124(2), 599–622.

[14] Rogers, E. M. (2003). Diffusion of innovations. New York, USA: Simon and Schuster.

[15] Shahid, S., & Siddiqui, R. P. (2021). Big data analytics in public sector university libraries in Pakistan. Library Philosophy and Practice (E-journal), (6291). Retrieved from https://digitalcommons.unl.edu/libphilprac/6291

[16] Sun, J., Liu, Y., Yang, L., Jiang, Y., & Wang, J. (2018). Collaborative matrix factorization mechanism for group recommendation in big data-based library systems. Library Hi Tech, 36(3), 458–481.

[17] Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly, 27(3), 425–478.