

Empowering Librarians Through Data Analytics: Advancing Skills for Modern Information Services

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ABSTRACT

In an era defined by digital transformation, librarians are increasingly expected to transcend traditional roles and integrate data analytics into library operations to support evidence-based decision-making and enhance service delivery. This study investigates the current level of data analytics proficiency among Nigerian librarians, explores perceived relevance, identifies key challenges, and proposes strategies for capacity development. A survey was conducted among 63 professional librarians across academic libraries in Nigeria, and data were analyzed using descriptive statistics. Findings reveal that most librarians possess only basic or intermediate proficiency in tools such as Microsoft Excel, SPSS, Power BI, and data visualization techniques. Notably, Power BI and advanced data cleaning remain areas of low competence. The major barriers to skill acquisition include a lack of formal training (87.3%) and limited institutional support (6.3%), especially in mentorship. Despite these challenges, an overwhelming majority (90.5%) perceive data analytics as highly relevant to their professional responsibilities, highlighting a strong willingness to learn and adapt. The study recommends integrating data analytics into LIS curricula, institutionalizing regular professional training, and fostering mentorship and support systems. It also advocates for policy reforms and dedicated funding to bridge the data competency gap. By empowering librarians with data analytics skills, libraries can better align with global digital trends and reinforce their roles as indispensable partners in academic and research ecosystems.

Keywords: Librarians, Data Analytics, Skills, Information Services, Service Delivery

INTRODUCTION

In today's data-driven society, the professional landscape of librarianship is experiencing a profound and accelerating transformation. Librarians are no longer confined to the traditional role of custodians of books and static information resources; instead, they are increasingly positioned as active intermediaries in the management, interpretation, and strategic use of data to inform decision-making and deliver innovative information services. This shift is not merely a trend but a response to the expanding scope of information needs in academic, governmental, and public domains, where data literacy is now recognized as a foundational competency for modern knowledge workers (Westbrooks, 2023).

Nowhere is this evolution more urgent than in Nigeria, where librarians operate at the crossroads of technological underdevelopment and growing demand for digital services. With the rise of big data, learning analytics, and institutional research requirements, Nigerian libraries are under pressure to transcend conventional service models and embrace data-informed strategies to remain relevant. As Adefila, Oyelude, and Ojo (2023) emphasize, many academic librarians in Nigeria are aware of the value that data analytics can bring to library operations, including resource optimization, user behavior analysis, and performance evaluation. However, a significant gap persists between this awareness and actual proficiency, largely due to limited training, infrastructural challenges, and the absence of institutional policies supporting data-driven innovations.

Moreover, the growing role of digital platforms and social media in library services, as discussed by Ezeani and Igwesi (2012), highlights the increasingly porous boundary between traditional librarianship and digital

information management. This intersection demands new skill sets ranging from data visualization and predictive modeling to the use of specialized tools like SPSS and Power BI that are not yet fully embedded within Nigerian library systems. These demands are further magnified by rapid changes in user expectations and the global shift toward open science, digital scholarship, and remote access services.

Encouragingly, several empirical studies have drawn attention to the state of digital and data literacy among Nigerian librarians. Emiri (2015) observed that while librarians in Edo and Delta States demonstrate baseline ICT skills, most lack the competencies needed for advanced data manipulation and analysis. This is consistent with the findings of Chukwuemeka and Idris (2023), who noted a strong positive correlation between digital proficiency and quality of service delivery at Taraba State University. Despite these findings, professional development opportunities remain sporadic and unevenly distributed, leaving many librarians unable to keep pace with technological advancements and institutional expectations.

Another critical area that requires urgent attention is the integration of data literacy into formal library and information science (LIS) education. According to Anyaoku, Ezeani, and Ezema (2015), embedding data-related competencies into LIS curricula is essential to prepare future librarians for the demands of a digital-first information ecosystem. Their position is echoed by Okike and Edewor (2022), who advocate for cross-disciplinary collaboration between LIS departments and ICT units to develop a more robust and adaptive training framework. Without such curricular innovations, the data competency gap will likely persist, undermining the ability of librarians to contribute meaningfully to academic research, knowledge management, and community engagement.

As libraries continue to adapt to the dynamic challenges of the 21st century ranging from hybrid learning models to data governance and digital inclusion, it becomes increasingly clear that equipping librarians with data analytics skills is not optional, but imperative. Embracing these competencies will not only elevate the professional relevance of librarians in Nigeria but also ensure that library institutions remain critical infrastructures for lifelong learning, institutional accountability, and informed citizenship.

Statement of Problem

In the digital age, libraries are no longer mere custodians of physical information resources, they are now integral to data-driven research, institutional planning, and digital literacy development. Despite the global shift toward data-centric services, many librarians in Nigeria still lack adequate training and tools to leverage data analytics in their professional roles. This gap poses significant limitations on their ability to provide evidence-based services, evaluate resource usage effectively, and support data-intensive academic research. Several studies within the Nigerian context have highlighted this concern. Adefila et al. (2023) observed that while Nigerian academic librarians acknowledge the importance of data analytics, many report low proficiency and lack institutional support for upskilling.

Similarly, Emiri (2015) revealed that digital literacy among librarians in Edo and Delta states remains below optimal levels, limiting their capacity to engage in more advanced data practices. These challenges are further compounded by infrastructural constraints, limited access to training, and a historical undervaluation of data-oriented competencies within library systems (Chukwuemeka & Idris, 2023).

Objectives of the Study

- i. Assess the current level of data analytics skills among practicing librarians in Nigeria.
- ii. Identify the barriers to the adoption of data analytics in library services.
- iii. Explore librarians' perceptions of the relevance and applicability of data analytics in their professional responsibilities.
- iv. Recommend strategies for integrating data analytics into library education and continuous professional development programs.

Research Questions

- i. What is the current level of data analytics knowledge and skill among Nigerian librarians?
- ii. What challenges do librarians face in acquiring and applying data analytics skills?
- iii. How do librarians perceive the relevance of data analytics to their professional practice?
- iv. What institutional and educational strategies can be implemented to promote data analytics competencies among librarians?

LITERATURE REVIEW

The integration of data analytics into library science represents a shift from traditional information management toward a more dynamic, evidence-based service model. Data analytics in libraries refers to the application of statistical, computational, and visualization tools to inform decision-making regarding library operations, user engagement, and resource allocation. Increasingly, it is viewed not as an optional enhancement but as a fundamental requirement for modern librarianship. As noted by Westbrook (2023), the growing complexity of digital information environments necessitates that librarians develop competencies beyond traditional cataloging and bibliographic instruction. These competencies include data mining, predictive analytics, and dashboard development skills that is historically associated with data science. This evolution reflects the broader digital transformation occurring across knowledge institutions globally.

Recent international literature further emphasizes the expanding role of libraries in data-intensive environments. Pinto et al. (2024) argue that academic libraries are increasingly expected to integrate information, media, and data literacy into their core services. However, their study highlights that while data literacy is gaining attention, its assessment and systematic implementation remain underdeveloped. Similarly, Ncube and Ngulube (2025) observe that libraries are adopting learning analytics to personalize services and enhance student outcomes, yet these efforts are often constrained by inadequate staff competencies, governance frameworks, and infrastructure.

Federer et al. (2018) distinguish between “data generalists” and “data specialists,” underscoring the need for differentiated training pathways that reflect varying levels of engagement with data services. In a related study, Fuhr (2022) found that academic librarians involved in research data services require competencies in data management, metadata standards, technical tools, and policy frameworks. The study further revealed that higher levels of engagement in data services are strongly associated with increased technical proficiency, suggesting that institutional investment in training and professional development is essential.

Within the Nigerian context, Ezeani and Igwesi (2012) argue that early adoption of digital technologies, particularly social media and web-based platforms has laid a foundation for data-driven service delivery in libraries. However, the absence of structured frameworks for data analytics continues to limit the effective utilization of data in decision-making processes. Adefila et al. (2023), in a cross-sectional study of Nigerian university librarians, reported a high level of awareness regarding the importance of data analytics but identified a significant skills gap. While respondents acknowledged the value of data-driven decision-making, only a small proportion demonstrated practical proficiency in tools such as Microsoft Excel, Power BI, and SPSS.

This gap between awareness and capability is further supported by Emiri (2015), who found that librarians in Edo and Delta States possess moderate ICT skills but exhibit low proficiency in advanced analytical tasks such as data visualization and statistical analysis. Similarly, Anunobi and Ezejiofor (2021) reported that many librarians lack confidence in applying data analytics tools despite having access to digital technologies. These findings suggest that digital literacy, while necessary, does not automatically translate into data literacy.

Comparatively, studies examining the impact of digital competencies on service delivery provide valuable insights. Chukwuemeka and Idris (2023) found a strong positive relationship between digital literacy and service quality in Taraba State University, indicating that technically skilled librarians are better positioned to enhance user engagement and service effectiveness. This aligns with global findings by Kim (2024), who reported that

librarians recognize the importance of data literacy for supporting student success but often lack the confidence and pedagogical frameworks to effectively integrate it into practice.

Another critical issue identified in the literature is the inadequacy of library and information science (LIS) curricula in addressing emerging data competencies. Anyaoku et al. (2015) criticized the outdated structure of LIS education in Nigeria and advocated for the inclusion of courses in data analytics, machine learning, and data visualization. This concern is echoed by David-West and Ig-Worlu (2023), who argue that the Nigerian educational system struggles to keep pace with rapid technological advancements, thereby limiting the preparedness of graduates for data-driven environments. Okike and Edewor (2022) further recommend collaborative training initiatives between LIS departments and ICT units as a strategy for bridging this competency gap.

Globally, the role of libraries in research data management (RDM) also highlights the importance of analytics capabilities. Arthur et al. (2025), in a study of Ghanaian academic libraries, found that libraries are actively supporting research data services through policy development, repository management, metadata creation, and data literacy training. However, the study emphasizes the need for continuous capacity building to ensure that librarians can effectively manage evolving data ecosystems. Similarly, Tella (2021) highlights the potential of big data in improving library services but recommends the recruitment of data experts and the establishment of robust data infrastructures.

While the employment of data specialists is beneficial, the literature consistently emphasizes the importance of equipping librarians themselves with data analytics skills. Developing these competencies not only reduces dependence on external expertise but also enhances the ability of librarians to engage in evidence-based decision-making, improve service delivery, and remain relevant in an increasingly data-driven information landscape.

METHODOLOGY

Population of the Study

The population for this study comprises professional librarians working in academic libraries across Nigeria, particularly in private institutions. These institutions are selected due to their relevance in research-driven environments, and representation of a broad range of library services.

Sample Size and Sampling Technique

The study targeted Academic librarians, simple random sampling technique was adopted, from private academic institutions in the South-West region of Nigeria. This sampling approach ensured fair representation across different library roles such as reference librarians, systems librarians, and cataloguers thereby supporting inclusivity and diversity in the study population.

Instrument Validity

The instrument was validated through expert review to ensure clarity, relevance, and alignment with the study objectives. Content validity was achieved by developing items based on established constructs in the literature.

Instrument Reliability

Reliability was determined using Cronbach's Alpha, which yielded a coefficient of 0.93, indicating high internal consistency and suitability of the instrument.

Data Collection Procedure and Method of Data Analysis

Out of the 75 librarians invited to participate, a total of 63 valid responses were received, yielding an 84% response rate. Data were collected using a structured questionnaire administered electronically via Google Forms. Follow-up reminders were issued to improve participation. The collected data were analyzed using descriptive statistics, including mean, frequencies, and percentages. The analysis was conducted with the aid of

SPSS version 25, enabling the examination of relationships between librarians' demographic characteristics, levels of digital literacy, and their perceptions and usage of data analytics in professional practice.

Findings and Discussion

Research Question One: What is the current level of data analytics skill among Nigerian librarians?

	Not Proficient	Basic Knowledge	Intermediate	Advanced	Expert
Microsoft Excel	7(11.1%)	18(28.6%)	22(34.9%)	6 (9.5%)	10 (15.9%)
SPSS or Similar Statistical Tools	12(19.0%)	37(58.7%)	5(7.9%)	9 (14.3%)	0 (0%)
Power BI or dashboards	24(38.1%)	35(55.6%)	0(0%)	2 (3.2%)	2 (3.2%)
Data Cleaning Techniques	14(22.2%)	35(55.6%)	10(15.9%)	2 (3.2%)	2 (3.2%)
Data Visualization	9(14.3%)	42(66.7%)	6(9.5%)	4 (6.3%)	2 (3.2%)

Relevance

	Frequency	Percent(%)	Valid Percent	Cumulative Percent
Irrelevant	2	3.2	3.2	3.2
Neutral	4	6.3	6.3	9.5
Relevant	41	65.1	65.1	74.6
Very Relevant	16	25.4	25.4	100.0
Total	63	100.0	100.0	

The data reveals that most librarians possess only basic knowledge across key data analytics tools. In Microsoft Excel, 63.5% rated themselves as either basic or intermediate, while 25.4% were advanced or expert. For SPSS, 58.7% had basic knowledge, and 19% lacked proficiency entirely. Power BI skills were lowest, with 93.7% reporting only basic or no proficiency. In data cleaning, 55.6% had basic skills, and 22.2% were not proficient. Data visualization followed a similar trend, with 66.7% indicating basic knowledge and just 3.2% identifying as experts. These findings indicate limited capacity for advanced data analytics, highlighting the need for structured training and professional development programs to enhance analytical competencies and tool usage among librarians.

Research Question Two: What challenges do librarians face in acquiring and applying data analytics skills?

Challenges faced by Librarians

	Frequency	Percent	Valid Percent	Cumulative Percent
Inadequate Infrastructure	4	6.3%	6.3	6.3%
Lack of formal training	55	87.3%	87.3	93.7%
Not relevant to my job	2	3.2%	3.2	96.8%
Others	2	3.2%	3.2	100.0%
Total	63	100.0%	100.0	

Support Needed for Parent Institutions

	Frequency	Percent	Valid Percent	Cumulative Percent
Dedicate time for skill development	21	33.3%	33.3	33.3%
Funding	38	60.3%	60.3	93.7%
Others	4	6.3%	6.3	100.0%
Total	63	100.0%	100.0	

The analysis shows that the primary challenge faced by librarians in acquiring and applying data analytics skills is a lack of formal training opportunities, cited by 87.3% of respondents. A lesser proportion (6.3%) identified inadequate infrastructure as a barrier, while others noted that data analytics is not perceived as relevant (3.2%) or cited other unspecified factors (3.2%). Regarding support structures, the majority (60.3%) emphasized the need for dedicated funding to enhance skill acquisition. Additionally, 33.3% highlighted the importance of dedicated support personnel (e.g., mentors or data experts), while 6.3% suggested other forms of support. These results suggest that overcoming training gaps and resource constraints particularly funding and expert support will be critical to building data analytics competencies among librarians in Nigeria.

Research Question Three: How do librarians perceive the relevance of data analytics to their professional practice?

Frequency	Frequency	Percent	Valid Percent	Cumulative Percent
Irrelevant	2	3.2%	3.2	3.2%
Neutral	4	6.3%	6.3	9.5%
Relevant	41	65.1%	65.1	74.6%
Very Relevant	16	25.4%	25.4	100.0%
Total	63	100.0%	100.0	

The findings indicate a strong positive perception among librarians regarding the relevance of data analytics to their professional roles. A combined 90.5% of respondents considered data analytics either relevant (65.1%) or very relevant (25.4%) to their work. Only a lesser proportion expressed neutrality (6.3%) or viewed it as irrelevant (3.2%). This suggests that librarians increasingly recognize the value of data-driven decision-making in enhancing service delivery, user engagement, and resource management within libraries. The overwhelmingly positive perception underscores a readiness to integrate data analytics into library practice, provided that adequate training, infrastructure, and institutional support are in place.

Research Question Four: What institutional and educational strategies and supports can be implemented to promote data analytics competencies among librarians?

	YesF (%)	NoF (%)	Maybe
LIS Curriculum	58(92.1%)	00(0%)	5(7.9%)
Analysis Training	18(26.8%)	34(54.0%)	11(17.5%)

Support Needed for Parent Institutions

	Frequency	Percent	Valid Percent	Cumulative Percent
Dedicate time for skill development	21	33.3%	33.3	33.3%
Funding	38	60.3%	60.3	93.7%
Others	4	6.3%	6.3	100.0%
Total	63	100.0%	100.0	

The majority of respondents (92.1%) affirmed the inclusion of data analytics in LIS curriculum as a key strategy for building competencies. However, only 28.6% reported that analysis training programs are currently available, while 54% indicated no access to such training, suggesting a significant gap between awareness and implementation. In terms of institutional support, 60.3% emphasized the importance of dedicated funding, while 33.3% advocated for dedicated support staff such as data mentors or IT personnel. These findings highlight that while librarians recognize the importance of data analytics, effective promotion requires curricular integration, structured training, and institutional investment in resources and personnel to foster practical skill development.

DISCUSSION OF FINDINGS

Research question one revealed that while librarians possess some foundational knowledge of data tools, there is a significant deficit in advanced competencies. For instance, only 25.4% of respondents rated themselves as either advanced or expert users of Microsoft Excel, a tool widely considered entry-level in data analytics. Power BI, a more robust platform for interactive data visualization, showed the weakest proficiency, with just 6.4% identifying as advanced or expert, and a staggering 93.6% reporting basic or no proficiency. This confirms previous studies by Adefila et al. (2023) and Emiri (2015), which reported that Nigerian librarians are aware of the importance of analytics but lack the technical capabilities to utilize them effectively. As Westbrook (2023) posits, modern librarianship demands skills that extend far beyond cataloging and bibliographic instruction, yet the professional reality in Nigeria still lags behind this ideal.

The second research question revealed that the primary challenge, cited by 87.3% of respondents, is the lack of formal training opportunities. Other barriers include inadequate infrastructure (6.3%) and a perceived irrelevance of data analytics to librarianship (3.2%). These challenges mirror the systemic issues raised by Anyaoku et al. (2015), who argued that the current LIS educational framework in Nigeria fails to adequately prepare librarians for data-centric roles. The high demand for training but lack of accessible programs reflects a structural deficiency that must be urgently addressed. Moreover, the necessity for institutional support is underscored by the 60.3% of respondents who called for dedicated funding, and 33.3% who emphasized the importance of mentorship and expert personnel. This supports Federer et al. (2018), who emphasize the value of distinguishing between "data generalists" and "data specialists" and tailoring support accordingly within library systems.

The third research question encouragingly found strong positive sentiment regarding the relevance of data analytics to library practice: 90.5% of librarians deemed data analytics either relevant or very relevant to their professional responsibilities. This affirms the assertion by Nash et al. (2024) that data fluency is becoming a cornerstone of effective library service delivery, especially in academic institutions. This positive perception reveals a readiness among Nigerian librarians to evolve professionally if given the proper tools and training. It suggests that the challenge is not one of motivation, but rather of systemic support. As noted by Chukwuemeka and Idris (2023), librarians with stronger digital literacy skills are often more successful in user engagement and information service delivery. The implication is clear: investing in analytics training will yield not just individual empowerment, but institutional advancement.

The last research question strongly supports integrating data analytics into library education. A decisive 92.1% of respondents agreed that LIS curricula should include analytics training. Yet, only 28.6% reported having access to such training in their current professional context, while more than half (54%) had none at all. This stark discrepancy between awareness and implementation points to a policy-practice gap. Anyaoku et al. (2015) and Okike & Edewor (2022) have both called for a radical restructuring of LIS programs to incorporate courses in machine learning, data visualization, and analytics tools. The findings of this study provide fresh empirical validation for such curricular reforms. Furthermore, the data highlights the importance of institutional investments particularly in funding and support personnel as key enablers of sustained skill acquisition and application.

CONCLUSION

This study has highlighted the evolving role of Nigerian librarians in a data-driven world and examined their readiness to embrace data analytics as a core professional skill. The findings underscore a significant gap between the increasing relevance of data analytics in library operations and the actual competencies possessed by practicing librarians. While there is widespread recognition of the importance of data analytics reflected in strong positive perceptions there remains a notable deficiency in practical skills, particularly with advanced tools like Power BI and SPSS. The primary challenges identified include a lack of formal training opportunities, inadequate institutional support, and insufficient inclusion of data analytics in library and information science (LIS) curricula. Despite these challenges, librarians have demonstrated both interest and willingness to engage with data analytics, provided the necessary training and support structures are in place. The study concludes that empowering Nigerian librarians with data analytics skills is no longer optional but rather imperative for

sustaining relevance and excellence in modern information services. Addressing this skills gap will not only improve individual competencies but will also elevate the overall quality of library services, enhance evidence-based decision-making, and position libraries as integral to academic research, planning, and innovation.

RECOMMENDATIONS

- i. **Integrate Data Analytics into LIS Curricula:** Library schools in Nigeria with the support of Librarian Registration Council of Nigeria (LRCN) should revise the curricula to include core modules in data analytics, data visualization, and digital tools such as Excel, SPSS and Power BI.
- ii. **Institutionalize Regular Professional Training:** Academic libraries and professional bodies (e.g., Nigerian Library Association) should organize periodic workshops, webinars, and certifications on data analytics.
- iii. **Secure Dedicated Funding for Capacity Building:** Institutional heads and government agencies should allocate specific budgets for librarian upskilling in data analytics. Funding should cover training costs, software licenses, internet access, and the procurement of analytics tools.
- iv. **Establish Mentorship and Support Networks:** Libraries should foster mentorship programs by pairing less experienced staff with data-savvy librarians or ICT professionals. Creating peer learning communities will encourage continuous development and collaborative problem-solving.
- v. **Promote a Data-Driven Culture in Libraries:** Library leadership should actively promote the use of data in decision-making, service evaluation, and user engagement. Encouraging staff to develop dashboards, analyze usage statistics, and present findings during departmental meetings will gradually embed analytics into daily operations.
- vi. **Policy Advocacy and National Strategy:** National library associations should advocate for the inclusion of data competencies as part of minimum professional standards. A national strategy for digital transformation in libraries should also include provisions for data literacy and analytics as a priority area.

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Data Availability Statement

The data that support the findings of this study are available from the corresponding author, Aderonke Ogungbade, upon reasonable request. Due to privacy and ethical considerations involving human participants, anonymized datasets can be shared with researchers who meet the criteria for access to confidential data. No publicly archived dataset is available at this time.