

Collaborative Efforts with External Organizations done by ICIPE and ILRI Libraries to Enhance Big Data Management

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Abstract

Purpose: The rapid advancement of network technologies has resulted in an overwhelming influx of data, presenting significant challenges for research libraries in effectively managing this data to meet modern research needs. The current study aims to bridge the existing gap by assessing the collaborative initiatives put in place by ICIPE and ILRI research libraries to enhance big data management capabilities. The research objective was to evaluate how these partnerships contribute to the development and implementation of advanced data management systems.

Methodology: The study was guided by Technology Acceptance Model (TAM) which played a significant role in facilitating collaboration in libraries by providing a framework to understand user acceptance of new technologies. The study was conducted at the ICIPE and ILRI institutions, employing a descriptive research design. The target population included key stakeholders such as department heads, librarians, and graduate students. A sample size of 154 individuals was selected, including 13 department heads, 4 librarians, and 137 graduate students (58 PhD candidates and 79 MSc candidates). Sampling techniques included purposive sampling for department heads and stratified random sampling for scholars. Data was collected using structured questionnaires, and the validity and reliability of the instruments were ensured through pilot testing. Data analysis involved both quantitative and qualitative methods, using statistical tools to analyze responses.

Results: The study found that collaborative efforts between the libraries are pivotal in pooling resources, knowledge, and expertise, facilitating the integration of cutting-edge technologies like data mining tools, and cloud-based storage solutions.

Conclusions: The collaborative approach adopted by the libraries not only strengthens their capacity to support research activities but also fosters a culture of data-driven decision-making across the institutions. This partnership serves as a model for other research institutions facing similar challenges. The leadership of ICIPE and ILRI continue to invest in infrastructure and joint training programs to further enhance big data management capabilities. Additionally, efforts should be made to address challenges such as the integration of diverse data sources and the protection of sensitive information. The study recommended development of more structured and formalized collaborative frameworks with external organizations, including clear policies and communication channels.

Keywords: *Technology, Big Data, Research Scholars, Implementation*

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1.0 Introduction

Big Data Management is a critical aspect of modern library and information science (LIS), involving the systematic organization, storage, and analysis of large and complex datasets to support research, decision-making, and service delivery. Effective big data management enables libraries to handle vast amounts of information, ensuring data quality, security, and accessibility, while also leveraging advanced analytics to derive meaningful insights. As the volume of data continues to grow exponentially, the ability to manage big data efficiently becomes increasingly important for LIS professionals, influencing the relevance and effectiveness of library services in the digital age.

Research collaboration is a vital component of continuous professional development (CPD) for LIS professionals. It is no longer optional but a necessary aspect of the profession. As social media and information and communication technologies (ICT) continue to reshape how, where, and when users engage with library materials and services, the field of librarianship is rapidly evolving. Despite these global shifts, many Nigerian institutions still predominantly offer traditional services, which poses a significant challenge in the digital age. For LIS professionals to meet or exceed the evolving needs of their users, engaging in research collaboration is essential. Such collaboration allows for broader and deeper contributions from professional colleagues with diverse perspectives, expertise, and experience, thereby transforming the role of the library and extending beyond conventional services (Fari, 2021; Abbas & Jawaid, 2019).

Globally, collaboration is critical for advancing Library and Information Science (LIS) both as a field of study and as a career. While teaching and learning are key functions in academic settings, research plays an even more crucial role in facilitating knowledge generation, dissemination, and professional development among LIS professionals. In academia, collaboration is a well-established and increasingly prevalent practice essential for achieving research goals. It enables nations and organizations to import and adapt ideas, policies, and exchange information and expertise, thereby driving innovation and growth in the LIS field (Fari, 2021; Abbas & Jawaid, 2019).

Regionally, the digital era has profoundly transformed the academic landscape, particularly in the realm of digital library services. Higher education institutions across various continents now face considerable pressure to offer services and curricula that meet the demands of contemporary society. This digital environment supports the development of social and physical infrastructure and promotes innovative teaching and learning methodologies. It also fosters the growth of professional learning networks, where educators can interact, share best practices, and apply new knowledge in the classroom. For example, Waham et al. (2023) emphasize the importance of international collaboration in their study of Indonesian and Iraqi institutions, where professionals and educators work together to address global challenges and prepare students for an interconnected world.

Locally, similar trends are observed in specific contexts like the United States, where collaboration is vital for minority-serving institutions. Ofili et al. (2021) explored how Research Centers in Minority Institutions (RCMI) can benefit from partnerships with other institutions to promote investigator development and research. The study, which gathered data from six RCMI Centers, demonstrated that such partnerships provide these institutions with access to funding opportunities, expertise, and valuable resources that might otherwise be unavailable. In Nigerian institutions, despite these global and regional shifts, many still predominantly offer traditional services, posing a significant challenge in the digital age. For LIS professionals in Nigeria to meet or exceed the evolving needs of their users, engaging in

research collaboration is essential. By participating in such collaborations, Nigerian LIS professionals can draw on global and regional trends to enhance their local practices and extend the role of libraries beyond conventional services (Hedges et al., 2021; Waham et al., 2023).

In Kenya, librarians have recognized the importance of big data management in libraries to meet the FAIR (findable, accessible, interoperable, and reusable) initiative (Senagi and Tonnang, 2022). However, challenges like limited information systems and ICT infrastructure have led to a lack of appreciation for big data management in libraries. Academic libraries in universities have particularly discussed the relevance of big data. The slow adoption of big data in libraries is attributed to a lack of awareness of its benefits and applicability (Kibe, 2019).

1.1 Problem Statement

Globally research libraries have demanded responsive mechanisms to adapt to changing environments to retain relevance, accessibility, and interoperability of their services. Noting the value of information to researchers, big data management demands research libraries to proactively implement coping mechanisms including collaboration and strategic partnerships to improve big data management.

In Kenya, libraries should be leveraging best practices in big data management, supported by specialized librarians, strong collaborations with leading partners, and sufficient budgets to manage and scale their data operations effectively.

However, the reality is far from ideal. Kenyan libraries face significant challenges, including a shortage of specialized librarians, poor collaboration with big data management experts, and limited financial resources. This has resulted in unsatisfactory responsiveness to big data needs, evidenced by limited collaborations, unclear policies on data quality, security, and privacy, and inadequate scalability to handle growing data volumes. Further issues include poor metadata documentation, difficulties in integrating diverse data sources, and limited analytics capabilities to extract actionable insights (Sani & Oseji, 2022; ICIPE, 2018; ICIPE, 2023).

These challenges underscore the need for enhanced collaboration and strategic partnerships to improve big data management in Kenyan libraries. Addressing these gaps is crucial for Library and Information Science (LIS) professionals to meet the demands of the digital age and contribute more effectively to research and knowledge dissemination. The purpose of this study was to examine the collaborative efforts between ICIPE and ILRI libraries and external organizations to enhance big data management and identify best practices for continuous improvement in their collaboration strategies and data management.

2.0 Literature Review

Institutions can do more by collaborating and utilizing their resources and knowledge base than they could on their own. Grounded by the Technology Acceptance Model (TAM) originating in information systems research, providing a lens to understand user acceptance and utilization of technological innovations within the specific context of library services. The Technology Acceptance Model (TAM) plays a significant role in facilitating collaboration in libraries by providing a framework to understand user acceptance of new technologies. TAM posits that perceived usefulness (PU) and perceived ease of use (PEOU) are critical factors influencing users' behavioral intentions to adopt technology. In the context of libraries, this model has helped identify how collaborative technologies can be effectively integrated into library services. Collaborative endeavours with external organizations are poised to be instrumental in enhancing big data management within research libraries. Through partnerships, libraries will access additional resources, diverse expertise, and unique perspectives. This collaborative

synergy is anticipated to elevate their capacity for effective big data management (Subaveerapandiyar, 2023).

Tenya et al.'s study from 2023 looks into the digital resources that Kenya's public institutions have access to for research and instruction. Researchers concluded that university libraries provide a narrow range of digital platforms, mostly institutional repositories, library catalogues, and websites. The study polled faculty, librarians, and library personnel. The content is accessible in several media (written, audio-visual), including these, e-books, and e-journals. The report suggests working with resource-sharing organizations, obtaining the rights to more items, and requiring instructors and students to turn in their research articles to the library to increase access and extend resources.

Based on the findings, the researcher identified key themes as follows: external organizations collaborations, effectiveness of your library's collaboration, technology-related changes, sustainability of digital content, and innovation. The study noted that libraries had collaborations with partnering organizations through the capacity-building department. However, libraries are also experiencing reverting issues relating to the shortage of specialized librarians, poor collaborations with partners who already excel in big data management, and limited library budgets (Sani & Oseji, 2022). Despite the best practices, research libraries' responsiveness to big data management remains unsatisfactory.

The theoretical framework informing this study is based on the Resource-Based View (RBV) theory, which posits that organizations can achieve sustained competitive advantage by effectively utilizing and integrating their internal resources with external partnerships. In the context of this study, the RBV theory underscores the importance of leveraging collaborations with external organizations to enhance libraries' big data management capabilities, thereby maximizing their collective resources and expertise.

3.0 Methodology

The study was conducted in Nairobi County, utilizing a cross-sectional survey research design to effectively address the research questions and achieve the predetermined objectives. The cross-sectional design is particularly well-suited for this type of research as it allows for the collection of data at a single point in time from a diverse group of participants, enabling the examination of various variables and their interrelationships. This design is commonly used in social science research to describe characteristics of a population or phenomenon and to make inferences about potential relationships between variables (Farias et al., 2020). The study focused on a sample of 154 individuals, consisting of 13 department heads, 4 librarians, 58 PhD candidates (32 from the International Centre of Insect Physiology and Ecology [ICIPE] and 26 from the International Livestock Research Institute [ILRI]), and 79 MSc candidates (49 from ICIPE and 30 from ILRI). This population was deliberately chosen to represent the key stakeholders involved in big data management within these research institutions.

A purposive sampling technique was employed, which involves the intentional selection of participants based on specific characteristics, such as expertise, experience, or knowledge relevant to the research topic. This method is advantageous when the research requires insights from individuals who are particularly knowledgeable about the subject matter (Meriam et al., 2019). By focusing on participants with relevant expertise, the study was able to gather in-depth information and insights that would not be accessible through random sampling methods.

Data collection used both quantitative and qualitative methods to provide a comprehensive understanding of the research problem. Quantitative data was gathered through questionnaires distributed to PhD and MSc candidates, focusing on their experiences with big data

management, including access to resources, system effectiveness, and perceptions of collaboration between ICIPE and ILRI. Qualitative data came from semi-structured interviews with department heads and librarians, exploring big data management practices, challenges, and the role of library collaborations (Roberts, 2020). The data analysis was methodologically rigorous, combining quantitative and qualitative techniques for robust findings. Quantitative data from questionnaires were analyzed using SPSS, which generated descriptive statistics and correlation analyses to explore relationships between variables like data management effectiveness and participant satisfaction (Pallant, 2020). Reliability was confirmed using Cronbach's alpha (Sileyew, 2019). Qualitative data from interviews and open-ended responses underwent thematic analysis, with key themes identified through coding (Kiger & Varpio, 2020). Themes revealed that ICIPE effectively implemented RFID technology for resource tracking, while ILRI faced challenges in adopting big data management practices. Findings were presented with tables and figures for quantitative data and thematic prose with participant quotes for qualitative insights, ensuring a comprehensive understanding of big data management at both institutions.

4.0 Results and Discussion

4.1 Response Rate

In this study, 100 out of 142 distributed questionnaires were returned, yielding a favorable 70% response rate, meeting social science research benchmarks (Mugenda & Mugenda, 2019). ICIPE had a 60.87% response rate, with 56 of 92 participants responding, while ILRI had a 66.00% response rate, with 33 of 50 participants. Although ILRI's response rate was slightly lower, it still provided valuable insights. Effective pre-survey communication and follow-up reminders contributed to the overall strong response rate (Edwards et al., 2023).

4.2 Background Information of Respondents

The demographic data revealed that among the 100 valid responses, 53.54% were from Master's students and 40.4% from PhD candidates, reflecting typical academic settings where Master's programs have larger enrolments (OECD, 2021). The educational background of respondents is important, as it shapes their views on effective big data management strategies. The higher representation of Master's students suggests that targeted strategies for this group could be impactful, while the significant presence of PhD candidates highlights the need for advanced resources to support their specialized research needs.

4.3 Results of Collaborations for Big Data Management

The study also explored the extent and frequency of collaborative efforts in big data management between the libraries at ICIPE and ILRI and external organizations. Respondents, including scholars and librarians, were asked to assess how often their organizations engaged in collaborative data management activities and the types of external organizations involved.

The responses to the survey indicated varying levels of engagement in collaborative efforts. Specifically: 33.3% of respondents strongly agreed that their organizations frequently engaged in collaborative data management activities. 25.5% agreed that such collaborations were common. 17.7% of respondents, however, disagreed, suggesting that a significant portion of the respondents did not perceive their organizations as being highly engaged in collaborative data management. Moreover, 77.7% of the respondents were able to identify the types of external organizations with which their libraries collaborated, indicating a high level of awareness among the participants regarding existing partnerships.

These findings suggest that while there is substantial engagement in collaborative activities, there is room for improvement, particularly in increasing the frequency and visibility of these collaborations. The awareness of external partnerships among respondents points to an existing framework of collaboration that could be further leveraged to enhance big data management capabilities at ICIPE and ILRI. (See Table 1)

Table 1: ICIPE and ILRI Engagement in Collaboration

Sentiments on Interest in Engagement in Collaboration (N=93)	SA(1)	A(2)	D(3)	SD	Mean
How often do you engage in collaborative data management activities with external organizations.	33(33.33%)	25(25.25%)	17(17.17%)	1(1.1%)	3.0
If yes, which type of external organizations does your library collaborate with? (Select all that apply) resources available on the library's websites.	77(77.7%)	52(52.5%)	25(25.2%)	24(24.7%)	5.0
How frequently does your library engage in collaborative efforts with external organizations for big data management?	44(44.4%)	35(35.7%)	8(8.5%)	1(1.1%)	3.2
What are the main areas of collaboration with external organizations for big data management? (Select all that apply).	60(60.6%)	40(40.42%)	30(30.33%)	25(25.28%)	4.5
How would you rate the effectiveness of your library's collaborative efforts with external organizations in enhancing big data management?	40(40.4%)	36(36.33%)	10(10.10%)	1(1.1%)	3.27
What are the biggest challenges you face in managing big data at ICIPE or ILRI (Select up to 2)	51(51.5%)	45(45.4%)	28(28.2%)	2(2.2%)	4.4
If yes, what are the main challenges? (Select all that apply)	50(50.5%)	41(41.4%)	36(36.2%)	20(20.1%)	5.0

The data in Table 1, shows that most of the scholars were satisfied with current collaborative data management activities with external organizations for handling big data. Despite the best practices, research libraries' responsiveness to big data management is unsatisfactory. This is evidenced by limited collaborations between libraries, and unclear policies regarding the management of data quality, security, and privacy, there is also limited scalability where there is the inability to scale infrastructure and systems to handle the growing volumes of data and lack of proper metadata documentation difficulties in integrating data from diverse sources and format and failure to diverse actionable decision from data. The findings anticipated in this investigation hold significance for various stakeholders. The research library management too found relevancy from the study results. They have been informed on areas of improvement regarding technology, collaboration, partnerships, policy frameworks, and preservation requirements hence making evidence-based decision-making on resource allocation, capacity building, and infrastructure development.

4.4 Collaborations for Big Data Management

The study's findings on collaborations for big data management indicate that there is a significant level of engagement between ICIPE, ILRI, and external organizations, but also highlight areas where further improvement is needed. A combined total of 58.8% of respondents either strongly agreed (33.3%) or agreed (25.5%) that their organizations frequently engaged in collaborative data management activities. This suggests that collaborative efforts are recognized and valued within these institutions, reflecting an understanding of the importance of partnerships in enhancing big data management capabilities (Grossman et al., (2022).

However, the fact that 17.7% of respondents disagreed indicates that not all participants perceive these collaborations as frequent or effective. This could be due to several factors, including differences in the levels of involvement or awareness among staff and students, or varying perceptions of the effectiveness of these collaborations. The presence of this dissenting view highlights the need for institutions to ensure that collaborative efforts are not only implemented but also well-communicated and inclusive so that all stakeholders feel engaged and aware of the benefits these partnerships bring (Kezar, 2018).

The finding that 77.7% of respondents could identify the types of external organizations their libraries collaborated with suggests a high level of awareness and involvement in these partnerships. This is a positive indicator, as awareness of existing collaborations is crucial for maximizing their potential benefits. When stakeholders are aware of and engaged in collaborative efforts, they are more likely to contribute effectively and help sustain these partnerships (Kezar, 2018).

Overall, these findings underscore the importance of collaboration in managing big data within academic and research institutions. Effective collaboration can enhance the capabilities of libraries and research centers, allowing them to leverage external expertise, share resources, and adopt best practices in data management (Kezar & Posselt, 2019) However, the study also points to the need for ongoing efforts to improve the frequency and effectiveness of these collaborations, ensuring that they are well-communicated and inclusive and that they effectively meet the needs of all stakeholders involved.

5.0 Conclusion

The study highlights the strengths and areas for improvement in big data management collaborations at ICIPE and ILRI, with a 70% response rate ensuring reliability (Mugenda & Mugenda, 2019). The diverse educational backgrounds of respondents emphasize the need for

adaptable strategies to meet the varying needs of Master's and PhD students (OECD, 2021). While respondents acknowledged the importance of collaborations, some felt they could be more inclusive and better communicated (Grossman et al., 2022; Kezar, 2018). Strengthening these partnerships and fostering a collaborative culture will be key to enhancing big data management at both institutions.

6.0 Recommendation

To enhance big data management collaborations at ICIPE and ILRI, several recommendations are proposed. First, the institutions should develop more structured and formalized collaborative frameworks with external organizations, including clear policies and communication channels (Kezar, 2018). Regular updates, workshops, and meetings can foster inclusivity and improve collaboration perception. Additionally, targeted training programs should be implemented to improve staff and student data management skills, with a focus on advanced tools for PhD candidates (Carpenter et al., 2020). Expanding collaborations by joining international consortia and industry partnerships will further enhance capacity (Arora, 2019). Lastly, robust monitoring and evaluation mechanisms should be established to ensure the long-term success of collaborative efforts (Sargsyan & Gevorgyan, 2024).

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