HARNESSING DATA LIBRARIANSHIP FOR BIG DATA IN ACADEMIC LIBRARIES

DR. FLORENCE OLABISI AJANI
Deputy University Librarian,
Kwara State University, Malate.
florence.ajani@kwasu.edu.ng

DR. SHUAIB AGBOOLA OLARONGBE
Polytechnic Librarian,
Prof. Sheu Jimoh Library,
Kwara State Polytechnic,
Ilorin, Kwara State.
olarongbe.sa@unilorin.edu.ng

ABDULAKEEM SODEEQ SULYMAN
Department of Library and Information Science,
Kwara State Polytechnic, Ilorin, Nigeria.
sulyman.abdulakeem@kwarastatepolytechnic.edu.ng
&
ABDULLAH OLAYINKA ISIAKA
Department of Library and Information Science,
Kwara State Polytechnic, Ilorin, Nigeria.
abdulyinka.isiaka@gmail.com

ABSTRACT

Big Data has revolutionised the library, shifting the library processes, operations and services to data-driven oriented. Thus, Data Librarianship evolved as a response to this significant change in libraries, thereby helping libraries in harnessing the values of large data volumes in all data-related activities. Noting that academic libraries engaged in varying data-oriented activities underscores why this study explores harnessing Data Librarianship for Big Data in academic libraries. Typology design of conceptual research was adopted. The design allows this study to logically discuss the concepts of Big Data, Data Librarianship and Data Librarians, dissecting the qualities of Data Librarians in harnessing the potentials of Big Data, library operations and services that constitute Big Data and explaining the challenges associated with leveraging Big Data for library services. Libraries have been responding to the need of exploiting the values of Big Data by assigning Data Librarians who

are data literate and skillful in recognising various data sources and types, accurately organising, analysing, and interpreting data to create taxonomies and metadata systems, systematize retrieval procedures, smart libraries, research data management/services and circulation and cataloguing systems through OCLC and other comparable data-sharing organisations. Nonetheless, Data Librarians encountered many problems in harnessing data values including absence of data policies, the scarcity of opportunities for data librarians to receive training, the absence of extra financial benefits, the lack of infrastructure and systems and lack of organisational support for the launch of data-driven services. This study has tactfully argued that Big Data has given birth to a new field called Data Librarianship. Libraries and other similar information institutions may now take advantage of the value of their massive volumes of data by redesigning their decision-making and problem-solving processes using data-driven insights.

Keywords: Academic libraries, Big Data, Data Librarianship, Databrarians, Research data management

Introduction

The plural form of the Latin term "Datum," "data," has emerged as one of the most talked-about and in-demand components of contemporary civilization. Despite being unfiltered and raw, data has a tremendous amount of power to affect choices and the results of activities. In many modern commercial organisations, data is becoming an essential part of planning and decision-making, leading to new business processes and efficiency gains (Tredinnick, 2023). Large volumes and amounts of data are generated and managed as a result of the integration of data into the organisation's activities and procedures. The rise in popularity of this phenomena makes it necessary for experts whose work involves data to develop the term "Big Data." The term "big data" originated in the mid-1990s and is now widely used (Mishra, Luo & Jiang, 2017) in various disciplines including Library and Information Science (LIS).

Valmohammadi and Varaee (2023) define big data as a collection of extraordinarily large and intricate data sets that are difficult to extract, store, analyse, and visualize with conventional methods. The rise in data volumes that are difficult for conventional database technology to handle, store, and analyse is referred to as "big data" (Iaksch *et al.*, 2021; Hashem, Yaqoob & Anuar, 2015). ICT advancements have altered the creation, sharing, and administration of data in libraries. Data librarianship is the new name for the careful and effective administration of data in libraries. Previously merely a catchphrase, data librarianship is now recognised as a legitimate job title and role in academic libraries (Khan & Du, 2018). Thompson and Kellam (2016) assert that the field of data librarianship is not new, since it comprises a wide range of forms, functions, and specialisations that are essential to teaching and research in academia.

Data librarianship emerged as a response to Song *et al.* (2020)'s observation that LIS is going through a unique phase of change and development in this data-driven era. Information science and library science have both seen some modifications as a result of this. LIS practitioners can successfully track the evolution of their profession in the twenty-first century by precisely documenting

and analysing these changes. This will serve as a reference for the unique and emerging parts of their profession, including data librarianship. The combination of information science, data science, and e-science sectors is known as data librarianship, or data-driven librarianship, and it is gradually becoming more and more important in the LIS field (Ashiq & Warraich, 2024). The amount of digital data generated in libraries has increased and frequently beyond their data storage capacity (Valmohammadi & Varaee, 2023), highlighting the need to use the benefits of big data through data librarianship in order to create new library services (Semeler, Pinto & Rozados, 2019). This underscores why this study explores harnessing Data Librarianship for Big Data in academic libraries.

Statement of the Problem

The increasing importance of data in decision-making and problem-solving processes has rendered enormous amounts of data essential in libraries. Data librarianship has emerged as a result of the phenomena known as big data. With experts in data gathering, curation, storage, sharing, and dissemination for libraries, it has broadened the field of librarianship and improved library services. According to Thompson and Kellam (2016), data services are gaining more attention in academia as a result of the rise of Big Data, open data, and especially research data curation on the radar screens of many libraries. However, this subject has long been a major focus of academic libraries. According to a survey conducted as of 2012, Tenopir, Birch, and Allard (2012) revealed that a mere "minority of US and Canadian academic libraries" offered data services of any kind. Yoon and Schultz (2017) later reported that libraries are increasingly using data services.

While information science shifted from an information-based to a data-focused orientation, library science saw a shift in its research concentration from traditional to digital libraries (Song *et al*., 2020). According to Kim (2013), academic libraries ought to be pushed to create data librarianship, a brand-new professional practice area. These days, libraries produce a significant amount of vital data (Valmohammadi & Varaee, 2023), which includes metadata for information resources, user data, and publishing bibliographic data. While data is important, there is a growing body of literature suggesting that its widespread appreciation by information practitioners has led to the emergence of dark data and the data deluge, which presents libraries with the challenge of effectively and methodically handling the plethora of new informational challenges. These challenges have been made even more acute in the last ten years by the open Big Data Movement (Pinto *et al*., 2024). This idea explains why this study explores harnessing Data Librarianship for Big Data in academic libraries.

Objectives of the Study

The main objective of this study is to explore harnessing Data Librarianship for Big Data in academic libraries. The specific objectives are to:

1. present a systematic review of Big Data, Data Librarianship and Data Librarians;
2. identify the qualities possessed by Data Librarians in harnessing Big Data;
3. examine how Data Librarians harnessed Big Data for academic libraries' services; and
4. identify the challenges with harnessing Big Data values in academic libraries.

Methodology

This study adopts a typology design of conceptual approach to explore the available literature on Data Librarianship, Big Data and how Big Data is revolutionizing libraries. Jaakkola (2020) opines that typology design provides a more consistent, coherent and explanatory set of types in a paper. It also provides accurate understanding of a phenomenon or concept, pinpointing and justifying key dimensions that distinguish the variants (Cornelissen, 2017). The typology approach helps this study in logically discussing the concepts of Big Data, Data Librarianship and Data Librarians, dissecting the qualities of Data Librarians in harnessing the potentials of Big Data, library operations and services that constitute Big Data, challenges associated with leveraging Big Data for library services and finally making appropriate recommendations based on the assertions of scholars and submissions found in the existing studies.

Review of Related Literature

Big Data, Data Librarianship and Data Librarian: Explicating their Nature

The amount of data that is available to researchers at academic institutions has increased, leading to a shift in data volumes from megabytes to gigabytes, terabytes, hexabytes, and tetabytes (Khan & Du, 2018). As a result, data is now more important than ever, leading to the massive amounts of data known as "Big Data." According to Saranya and Muthu Kumar (2015), the phrase "big data" refers to a vast volume of both organized and unstructured data that is challenging to manage using conventional software and database procedures due to its size. Data has emerged as a key component influencing the changing operations and environment of academic libraries, and in order to fully utilize this aspect, an actor or actors must be present who can identify the data, as well as their sources, and then assemble and compress the data to maximize library efficiency. According to Khan and Du (2018), society is starting to move from the information age to the Big Data era. Data and statistics are growing at a rate that has never been seen before. Data librarianship is a new branch of librarianship that has emerged as a result of researchers' interest in big data and electronic research.

According to Thompson and Kellam (2016), the term "databrarian" first appeared in a 2013 Library Journal article discussing the findings of the 2012 Placements and Salaries survey, and this is where the term "data librarianship" originated. The article mentioned new job names in libraries, such as data curator, data coordinator, and research data librarian. In order to improve library operations and user services, data librarianship is a branch of librarianship that focuses on the development, organisation, storage, sharing, and optimization of data values. Data Librarians, Data Services Librarians, Data Curation Librarians, and Research Data Management Librarians are the titles of library staff members who specialize in data-oriented activities in libraries (Khan & Du, 2018). Data librarians are concerned with offering services for data management and curation in libraries and other research organisations (Semeler, Pinto & Rozados, 2019). They also provide a way for storing, retrieving, searching, and tracking access to data in libraries (Khan & Du, 2018).

Big Data Characteristics

Compared to traditional data, the features of Big Data can be categorised by 5 Vs, namely, huge Volume, high Velocity, high Variety, low Veracity, and high Value (Jin *et al.*, 2015). The amount of data created in this section is very vital. The data size, which determines the value and potential of the data under consideration and whether it can actually take into account as big data or not. Name of 'big data' in itself contains a term that is related to size (Saranya & MuthuKumar, 2015). Velocity refers to the data transfer rate. The content is constantly changing due to the attraction of complementary data collection, the introduction of previously archived data or heritage collection, and input data flow from multiple sources (Hashem, Yaqoob & Anuar, 2015). The following aspect of big data is its variety. This means that large data categories that belong to the essential fact that should be known by data analysts. It helps the people, who are closely associated with the analysis of data, to effectively use the data to their benefit and thus retaining the importance of big data (Saranya & MuthuKumar, 2015). The quality of the data being caught can vary greatly. The correctness of analysis depends on the veracity of the source data (Saranya & MuthuKumar, 2015). Value is one of the most important features of big data. This feature is obtained through exploring hidden values of vast data with various kinds and rapid generation (Hashem, Yaqoob & Anuar, 2015).

Qualities Possessed by Data Librarians in Harnessing Big Data

The management and processing of library data have to change due to shifts in how data is used to power library operations and activities. Those with strong data literacy abilities must be present for this activity and pay close attention to it. Accurately organising, analysing, and interpreting data as well as recognizing various data sources and types will be made possible by this competence for the data librarian. Since the emergence of big data, libraries and librarians have to learn how to create metadata systems, systematize retrieval procedures, and create taxonomies in order to increase the usability, visibility, and accessibility of massive datasets. Big data utilisation is now essential for libraries in order to process information and enhance services. Intelligent services can be produced by utilising big data technologies. Technical and reader services could be enhanced by big data and smart libraries (Sani & Oseji, 2022).

At exponential rates, data librarians compile a variety of disparate data sets, which they then analyse to glean insightful information (Ofori & Cobblah, 2024). Data librarians ought to be knowledgeable about the many Big Data analytical techniques available. Data librarians should be interested in knowing the programming logic and languages of computers, databases, and information retrieval tools, according to Semeler, Pinto, and Rozados (2019). Data Librarianship is characterised by a diversity of interests but united by librarians' commitment to ensuring access to data, be they primary research data created by our institutions' researchers or secondary data used for analysis (Thompson & Kellam, 2016). Data Librarians provide users the ability to use the product for processing queries across multiple data sets in a timely manner and return the result set (Valmohammadi & Varaee, 2023).

Tredinnick (2023) contended that data analytics responsibilities are becoming more and more important in modern library work, going beyond only comprehending data quality. Librarians must comprehend the social settings in which information is created, shared, displayed, and

used in order to effectively contribute to enhancing the use of data in libraries. Libraries now provide a range of data support services, such as teaching and training, data management planning guidance, data stewardship and curation, and data visualization, as research grows more data-intensive and presents new challenges for researchers in managing and sharing research data. Studies conducted in the past few years show that library data services have expanded (Federer, 2018). The emergence of intelligence systems, data analytics, and data visualisations are examples of how data has grown in importance in modern library operations. Data has been linked to higher output as well as the creation of new prospects for library operations and services (Tredinnick, 2023). Ofori and Cobblah (2024) further supported this idea, stating that Big Data can be used to improve academic library collections, create personalized services, analyse user behavior, and support decision-making.

Big Data is defined as an enormous amount of data that grows exponentially and is not processed or analysed using a standard technique or kept in a regular storage medium (Kiran, 2019). Olarongbe, Ajani, and Kosoko-Oyedeko (2023) hinted that libraries are beginning to realize the enormous potential that Big Data presents for improving their services and enabling more effective access to information. Libraries may examine enormous volumes of data to learn more about the requirements, preferences, and behavior patterns of their patrons by utilising big data. This enables them to better adapt their services, activities, and collections to their clients' changing needs. According to Semeler, Pinto, and Rozados (2019), data librarians collect, organize, and sanitize data from a variety of sources in order to distribute the key findings of their research as pertinent information. At every level of scientific research, data librarians play a facilitator role by offering prospective services that could be helpful for data administration and curation. LIS professionals recognize the value of data-driven library services and believe that they can help libraries change their reputation, assist in creating institutional data banks or repositories, create data resources and services for users, particularly researchers, and gain recognition and appreciation from higher authorities (Ashiq & Warraich, 2024).

How Data Librarians Harnessed Big Data for Library Services

Libraries are uniquely positioned to offer Big Data analytics-related library services in addition to using Big Data for management purposes. Research data services like data management planning, data gathering, data curation, data archiving, and digital preservation are already provided by several libraries (Sugimoto *et al.*, 2012). According to Singh (2020), the steadily increasing number of circulation transactions, user information, online database usage, and other activities that take place in libraries highlight how important it is to leverage data-driven insights to improve services and operations. Since their computerization began in the 1960s, libraries have held a special place in the processing and management of Big Data. This has led to the development of large, electronically structured data resources, such as catalogue metadata, and has made it easier for users to access commercially available bibliographic databases. As part of the technological revolution in libraries, these structured databases were transferred to global networks by the introduction of the Internet, concurrently with the emergence of library websites that each provided unstructured data in different formats (e.g., text, graphics) (Nahotko, Zych, Januszko-Szakiel, & Jaskowska, 2023).

Data librarians gather, organize, and manage data from many sources with the goal of sharing significant research findings in the form of pertinent information. They serve as the research enablers at every level of the academic research cycle by offering every kind of data, information, and service needed for data management and curation. Because of this, their range of work is even more precisely matched to the needs and objectives that the researchers are pursuing within the framework of RDM (Al-Jaradat, 2021). Simultaneously, the data librarian transforms into a data scientist, applying his knowledge of data and computing to develop novel, data-driven products and services that facilitate data-intensive research in new ways (Tang & Hu, 2019).

Big Data's development has put libraries and librarians under pressure to evaluate their methods of operation in order to determine whether services and processes are data-driven. This demonstrates why big data plays a role in smart library services, as noted by Igwe and Sulyman (2022). In a similar vein, Sulyman, Ajani and Ahmed (2023) note that libraries now have potential to gain prominence in the field of research data management due to the growing popularity of open science, open research, and open data. Presently, data librarianship is concentrated on developing fresh library services that support RDM in novel ways and organising digital data generated in scientific research (Koltay, 2017; Singh *et al.*, 2022). According to Cox and Pinfield (2014), research data management includes a wide range of tasks and procedures associated with the lifecycle of research data, such as designing and creating data, storing it, protecting it, preserving it, retrieving it, disseminating it, and reusing it, all while taking organisational structure, ethical and legal issues, and technical viability into account.

According to Garoufallou and Gaitanou (2021), libraries have been interacting with Big Data ever since they automated their circulation and cataloguing systems through OCLC and other comparable data-sharing organisations. Furthermore, Dhamdhere (2021) emphasized that librarians deal with enormous volumes of data every day due to the upkeep of online literature, databases, data sets, and archives. Big data can aid with problem-solving and quality improvement to enhance library services. It can also assist librarians in offering library patrons cutting-edge, creative real-time services.

Challenges with Harnessing Big Data Values in Academic Libraries

Even while Big Data is becoming more and more important in libraries, giving data librarianship a much-needed role, there are still a number of obstacles to overcome before big data's potential in libraries can be fully realized. This is according to increasing literature. The main issues facing Data Librarianship, according to Ashiq and Warraich (2024), are the absence of data policies, the scarcity of opportunities for data librarians to receive training, the absence of extra financial benefits, the lack of infrastructure and systems, the lack of organisational support for the launch of data-driven services, and the lack of skills, knowledge, and expertise. Another difficulty is that, because data librarianship is seen as a complex field, influential library figures are compelled to place little to no emphasis on creating a framework for its procedures. For instance, Khan and Du (2018) bemoaned the lack of a

framework of core competencies for data librarianship by the American Library Association (ALA) and the lack of a specialisation in this quickly developing field in the Library and Information Science (LIS) curriculum.

Tredinnick (2023) brought out a few issues regarding the reasons for library directors' reluctance to introduce data services in their establishments. According to the author, using data can occasionally be linked to making bad decisions, either because of the methods by which the data is used or the caliber of the data that is used to make conclusions. For a variety of reasons, data might become harmful depending on the context in which it is utilised. For example, information could be incomplete, inaccurate, irrelevant, or otherwise deceptive, or we can be applying or interpreting it incorrectly.

Discussion of the Findings

Big Data practices are fast-becoming an integral component every setting, particularly information handling institutions. Findings have revealed that the astronomic rise in data-oriented activities in academic libraries have given birth to the concepts of "Data Librarianship" or "Databrarian," which is an emerging domain of Librarianship concentrated on harnessing the values of massive amounts of data known as "Big Data." The massive explosion of data, ranging from gigabytes, terabytes, hexabytes, and tetabytes has challenged academic libraries to devise means of enhancing and transforming operations and services in data-driven world. The growing attentions academic libraries are devoting to harnessing Big Data values give credence to the point of Thompson and Kellam (2016) that in recent times, academic libraries have started championing data management operations and services through Data Librarianship, which focuses on the development, organisation, storage, sharing and optimisation of data values in order to improve library operations and user services. For the sake of efficiency and effectiveness in dealing with data, Databrarians are trained on the basic features of Big Data, including huge volume, high velocity, high variety, low veracity and high value.

Not only that, findings showed that Databrarians interested in adding values to their library operations and services must possess metadata creation skills and be acquainted with the different systems used in managing metadata. Also, Databrarians must be able to systematize retrieval procedures, and create taxonomies in order to increase the usability, visibility, and accessibility of massive datasets. As research leans towards data-intensive, it presents new challenges for librarians in managing and sharing research data. Equipping Databrarians with the aforementioned skills will enable them provide a range of data support services, such as teaching and training, data management planning guidance, data stewardship and curation, and data visualisation.

Ofori and Cobblah (2024) stated that Big Data can be used to improve academic library collections, create personalized services, analyse user behavior, and support decision-making. Currently, Databrarians in academic libraries are handling Big Data to provide research data services like data management planning, data gathering, data curation, data archiving, and digital preservation. Singh (2020), on his part, believes that data-oriented activities in libraries are not limited to research. Singh (2020) emphasized that the steadily increasing number of circulation transactions, user information, online database usage, and other activities that take place in libraries have made leveraging Databrarians for Big Data indispensable. Despite the enormity of the potential of Big Data,

multitude of factors are hindering academic libraries from exploiting the values of Big Data in libraries. The factors, according to Ashiq and Warraich (2024) include the absence of data policies, the scarcity of opportunities for data librarians to receive training, the absence of extra financial benefits, the lack of infrastructure and systems, the lack of organisational support for the launch of data-driven services, and the lack of skills, knowledge, and expertise. Obviously, all these identified factors, coupled with poor awareness of Data Librarianship, affects the provision of data-driven services in most Nigerian academic libraries.

Conclusion

This paper has effectively demonstrated how academic libraries must keep up with the exponential growth of data, if they hope to continue to be relevant in their respective communities. In order to achieve this, libraries must develop a new vocabulary that emphasizes the gathering, organising, mapping, and management of data. They also need to train some staff members on how to enhance operations and services by utilising the limitless potential of both structured and unstructured data stored in libraries.

Recommendations

Based on points raised in the literature reviewed, this paper hereby recommends that:

1. Management of academic libraries should endeavour to train librarians on data literacy and its related components. The training will expose librarians to the strategies they can explore to harness the values of data and utilise it for the library's advantage.

2. Management of academic libraries should develop data policies and frameworks. These policies and frameworks will simplify the processes and enhance the collection, organisation, manipulation, synthetization and visualization of data for library operations and services.

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AUTHORS' PROFILE

Dr. Florence O. Ajani is Deputy University Librarian, Kwara State University, Malete, Nigeria. She is a certified librarian with profound and avid interest in Knowledge Organisation, Globalisation in Libraries, Reference Services and Academic Librarianship. She is a member of NLA and Nigerian School Library Association (NSLA). She holds a B.Sc. degree in Computer Science from University of Ilorin (1997), Master of Library, Archival and Information Studies (2005) and Ph.D. degree in School Media from the University of Ibadan (2018). For more than a decade, Dr. Ajani has been expanding the frontiers of Librarianship through teaching and research, which have culminated into different publications in conference proceedings, seminar papers and journal articles at both local and international fronts.

Dr. Shuaib Agboola Olarongbe is currently the Polytechnic Librarian, Kwara State Polytechnic, Ilorin. He holds Ph.D. in LIS from the University of Ilorin, Master of Library and Information Studies, from the University of Ibadan, and Bachelor of Library Science, from Bayero University, Kano. He is a Certified Librarian of Nigeria and a member of the NLA. He is an Adjunct Associate Professor at Al-Hikmah University, Ilorin. He started his professional career in September, 2006 as Librarian II at the Kwara State Public Library, Ilorin. He moved on to join the services of University of Ilorin as Graduate Assistant in July, 2008 as one of the pioneer academic staff in the Department of Library and Information Science. He has previously served as Postgraduate Coordinator, Examination Officer, SIWES Coordinator, and Level Adviser; all in the Department of Library and Information Science, University of Ilorin and also the immediate Sub-Dean, Faculty of Communication and Information Science, University of Ilorin. Dr. Olarongbe has supervised over a hundred (100) undergraduates' projects, twenty (20) master projects, and co-supervised three (3) Ph.Ds. He is an Associate Editor of International Journal of Information Processing and Communication (IJIPC) as well as the *Middlebelt Journal of Library and Information Science*. He has over 30 publications in reputable international and local publication outlets.

Abdulakeem Sodeeq SULYMAN is an emerging scholar of LIS, author and ghost writer. He began honing his LIS acumen at the Federal Polytechnic, Offa, Kwara State, Nigeria, where he earned both ND (Distinction) and HND (Distinction). He later proceeded to Kwara State University to earn his BLIS (First Class Honours). Sulyman is a Certified Librarian of Nigeria (CLN); Member, NLA; Life Member, LIS Academy India; Member, Africa ICT Alliance (AfICTA) and Editorial Board Member, Journal Region Cientifica, Colombia. Sulyman reviews for different national and international journals including International Journal of Information Research (IJIR), Journal of Librarianship and Scholarly Communication (JLSC) and International Journal of Library and Information Science (IJLIS). Currently, he is a lecturer at the Department of Library and Information Science, Kwara State Polytechnic, Ilorin, and a Master degree candidate at Al-Hikmah University, Ilorin, Kwara State, Nigeria.

Abdullahi Olayinka Isiaka is a Lecturer in the Department of Library and Information Science, Institute of Information and Communication Technology, Kwara State Polytechnic, Ilorin. He holds MLIS, University of Ilorin and BLIS, Kwara State University, Malete. He is a member of NLA, Kwara State Chapter. He started his professional career in December, 2022 as an Assistant Lecturer and one of the pioneer staff members in the Department of Library and Information Science, Kwara State Polytechnic, Ilorin. He has served as the Examination Officer, Project Coordinator and Member, Examination Malpractice Disciplinary Committee, Institute of Information and Communication Technology, Kwara State Polytechnic, Ilorin. He is currently and the pioneer Head of the Department. His areas of research include AI, Cloud Computing, Academic and National Libraries, Digital and Information Literacy, Cataloguing and Classification, Knowledge Management and Sharing, Electronic Information Resources, Collection Development, and ICT.