



Assessment of Librarians' Level of Awareness on Big Data Technologies for Enhanced Service Delivery in University Libraries in Northern Nigeria

By

Rilwanu Adamu; Rabi Sidi Musa; Zainab Daiyab Muhammad

radamu@yumsuk.edu.ng ; rabikhadisidi@gmail.com ; zdmuhammad@yumsuk.edu.ng Sule

Hamma Library Complex

Yusuf Maitama Sule University, Kano

&

Musa Ibrahim Bello (MNCS) danbattasaraki@gmail.com

Department of Computer Science,

Kano State Polytechnic

ABSTRACT

Big data technologies are the software tools used to manage all types of datasets both structured, semi-structured and unstructured data that organizations collect, analyze and mine for information and insights. Big data technologies can be categorized into four main types: data storage, data mining, data analytics, and data visualization. In today's digital age, libraries are not just repositories of books. They're hubs of information, generating and collecting massive amounts of data on user behavior, resource usage, and research trends. This study investigates the level of awareness among librarians in Northern Nigerian universities on the big data technologies. Survey research method using descriptive research design was adopted for this study. The population of the study comprised of 107 professional librarians working in university libraries within Northern Nigeria. The researchers adopted convenient sampling technique in selecting the sample size of the study. Data was collected using designed questionnaire on Google form and distributed the instrument link to different available social media platforms. A total number of 107 questionnaires were filled by the respondents, returned and found useful. Collected data were analyzed using frequency counts and percentages, mean and standard deviation. Findings of the study revealed that, librarians are highly aware of the concept of big data technologies and it's potential to transform library services. It also revealed that the primary sources of getting information about big data technologies are through social media, professional events, online courses, and webinars. It equally revealed that librarians in university libraries have a good understanding of two core characteristics (volume and variety)



of big data technologies and lacking in other areas. Findings also revealed that librarians recognize the potential of big data for optimizing resource management and accessibility,

improving resource collection and management, and improving overall service delivery. Findings revealed that, biggest challenges librarians anticipate for integrating big data technologies in libraries could be lack the technical skills required to utilize big data tools effectively, limited funding for big data infrastructure and librarian training, and compatibility issues between existing library systems and big data technologies. Recommendations were made in line with the research findings such as need for more enlightenment programs focused on applying big data technological tools in university libraries and also there is need for university libraries to pay more attention to the interactive, social learning, and self-directed learning options besides fostering collaboration and investing in internal training.

Keywords: Librarians, Awareness, Big Data Technologies, Universities and Analytical Tools.

1.0 Introduction:

Big Data Technologies could be seen as a set of tools and techniques designed to handle massive amounts of data that are too large, complex, or diverse to be processed using traditional data processing applications. These technologies enable organizations to extract valuable insights and make data-driven decisions from large and complex datasets. Some of the key technologies used in big data include: Hadoop, Spark, NoSQL Databases, Data Warehousing and Data Lakes, Data Mining and Machine Learning. Big data technologies can be categorized into four main types: data storage, data mining, data analytics, and data visualization. These technologies are used in a wide variety of industries, including healthcare, finance, retail, manufacturing, high institutions including libraries. They can be used to improve customer service, optimize operations, and make better business decisions.

University libraries being part of high institutions of learning are shoulder with the responsibility of providing information resources that keep on coming from different angles growing in volumes and speed justifying Ranganathan's law that library is a growing organism more especially in this digital age where we have both digital data and non-digital data. The growing volume and complexity of data in the digital age have made big data technologies essential for libraries to effectively manage and utilize their resources. Librarians, as information professionals, need to be aware of these technologies to ensure that their libraries can remain relevant and competitive. Leveraging these technologies to enhance service delivery and meet the needs of their users.

Understanding librarians' awareness of big data technologies, can help libraries identify areas where training and support are needed to improve service delivery. Also, big data technologies can help libraries optimize their resource allocation and management, ensuring that they are using their

***Corresponding Author: Rilwanu Adamu (June) 2024**
EDITION

MAIDEN



resources effectively. Librarians can use big data analytics to gain insights into user behavior, identify trends, and make data-driven decisions about library services and collections. As libraries face increasing competition from online resources, understanding and implementing big data technologies can help them remain relevant and competitive. Big data technologies can support researchers by providing access to large and complex datasets, as well as tools for analyzing and visualizing data. Big data technologies can help libraries manage the overwhelming amount of information available today and provide users with relevant and timely resources.

1.1 Research Problem:

The increasing importance of big data technologies in the modern library environment cannot be overemphasized. University libraries used to generate large and complex sets of data in the form of circulation and borrowing data, user search queries and behavior, digital repository data, library systems and application logs, user feedback and survey responses, collection metadata and cataloging data, library websites, social media handles, user authentication and authorization data, Wi-Fi analytics and so on. Initially, libraries are known for their roles in collection identification, selection, organization, description, storage and dissemination while these tasks transformed to data modelling, presentation or visualization, data analysis, data reformatting, data standardization. The traditional librarians also have a stake in this development as they have always been great at information management and organization.

In a research conducted by Chigwada and Kasiroori (2021) revealed that there is a lack of understanding and awareness among librarians regarding the potential benefits and applications of these technologies. This limited awareness may hinder libraries' ability to effectively utilize big data to enhance service delivery and meet the evolving needs of their users. This makes it necessary for librarians to equip themselves with the necessary skills in order to harness the potentials of big data technology for effective service delivery because with trillions of database entries (biometric data, automation, institutional repository, social media etc), images, and documents, coupled with diverse, voluminous and exponentially increasing research output of organizations, more researchers may wish to use collections as a whole. Thus mining and organizing the information in novel ways will definitely enhance information service delivery.

1.2 Research Questions:

The specific research questions are: -

1. To what extent are librarians in Northern Nigerian university libraries aware of big data technologies?
2. What are the primary sources of librarians' information regarding big data technologies?

***Corresponding Author: Rilwanu Adamu (June) 2024**
EDITION

MAIDEN



3. How well do librarians understand the core characteristics of big data (volume, variety, velocity, veracity, value)?
4. How do librarians perceive the potential of big data technologies for enhancing service delivery in university libraries?
5. What challenges do librarians anticipate in integrating big data technologies into their work?

Literature Review

The concept of Big Data was first defined by Laney, (2001) where he sees big data as mainly characterized by three Vs: Volume, Velocity, and Variety. The first V, refers to the data volume which is usually measured in terabyte and petabyte sized data sets. The second V, velocity refers to the situation where data is created dynamically and fast and the last V, refers to Variety which makes big data sets harder to organize and analyze. Big Data is also defined as amount of data just beyond technology's capability to store manage and process efficiently (Kaisler, Armour, and Alberto, 2012). Many librarians may not be fully aware of the potential benefits and applications of big data technologies. A lack of awareness of big data technologies could hinder libraries' ability to provide effective services. Hence, understanding and utilizing big data technologies is essential for libraries to remain relevant and meet the evolving needs of their users. The findings of the study conducted by Chigwada & Kasiroori (2021) revealed that librarians are lowly aware of the big data concept and they are not utilising the tools and techniques in data mining and analysis. The authors recommend that capacity building should be done to equip librarians with the requisite skills.

Libraries are needed to organise data, provide access to internal and external data sets, authorise copyright on property issues and facilitate the processes for reusing data and training users (Zhan & Widén, 2018). The management and analysing of big data sets initially was limited to the domain of big business, central governments and scientific and cultural communities engaged in higher education and research due to the huge hardware and software costs involved in analysing the big data. It was not possible for every profession to make use of big data sets and to deal with them. In due course of time, as a result of release of open source software tools, availability of cheaper hardware and software and lower costs of commodity servers, it became more easily available to business, academia, and local governments. Also, the ability to analyse big data in real time has changed. Early users of big data were born-digital firms that relied on analysing large data sets to manage their success like Facebook, LinkedIn, Google, and Twitter.

Computer Business Review (CBR, 2015) has published list of most popular Big Data tools. They are: Using the Anzo Software Suite, this open platform helps you to collect, integrate and analyze Big Data to help you build Unified Access solutions. The software has a data integration machine that streamlines data collection and assists with analytics. The key features include being able to combine data from multiple sources and customized dashboards to make analysis easy. This is a real-time SQL-on-Hadoop database which can help to derive real-time actionable insights, which is a clear benefit for those who are aiming for quick development. It is SQL 99 compliant with standard ANSI SQL and

***Corresponding Author: Rilwanu Adamu (June) 2024**
EDITION

MAIDEN



can scale from gigabytes to petabytes. As well as support for .NET, Java and Python, it also offers support for those written in JavaScript/AngularJS. Mark Logic is built to deal with heavy data loads and allow users to access it through real-time updates and alerts. It provides geographical data that is

combined with content and location relevance along with data filtering tools. This tool is ideal for those looking at paid content search app development. This free tool comes with various capabilities for visualizing data from a website such as hierarchical tree maps or just simple charts. This tool is easily implemented by embedding JavaScript code on a website and allows you to sort, modify and filter data as well as the ability to connect to a database or pull data from a website. Offering support for popular languages and with the security of knowing that Google will likely keep on improving its offering, this is a good option for many standard developers. Others are SAP's HANA platform offers a number of advantages over some of the competition, such as the ability to integrate and analyze large workloads of data to be analyzed in real time. This is extremely beneficial for the developer who is looking for speed to market. This is an open-source documental database that is ideal for developers who want to have precise control over the final results. MongoDB is also scalable and includes third party log tools such as Edda and Fluentd.. Pentaho joins data integration and business analytics for visualizing, analyzing and blending Big Data. The open and embeddable platform comes with extensive analytics capabilities with data mining and predictive analysis. The connectivity to any type of data source or source of data with native support for Hadoop, NoSQL and analytic databases. The data integration tools mean that users do not require coding in SQL or writing MapReduce Java functions. Straight away, one of the key benefits of Talend's Open Studio is that it is open source, which means that improvements will keep on rolling out as the community tweaks the tool. Its tools include products for developing, testing and deploying data management and application integration products. Additionally, the company manages the full lifecycle, even across enterprise boundaries. Tableau is one of the more well-known names in the data visualization sphere but it offers many tools for developers that are supported by an active community. Some of the key features of this software are its in-memory analytics database and advanced query language. API, XML, User Scripts, Python, and JavaScript are all supported and so are a number of browser extensions. Splunk specializes typically in harnessing machine data created from a number of different sources, such as websites, applications and sensors. The company also enables developers to write code using any technology platform, language or framework. Hadoop is open source software which made to handle big data. Hadoop was developed by Daug Cutting in 2005. Doug's son have an yellow toy elephant he called it as Hadoop and Doug's like that name so Dougs name it Hadoop. It was developed by Apache Software Foundation. Its first release was in 10 December 2011 and latest version 2.6.0 was release in 18 November 2014. It is written in Java language. It has Apache License 2.0. The apache Hadoop project develops open source software for reliable, scalable, distributed computing. The apache Hadoop software library is a frame work that allows for the distributed processing of large data sets across clusters of computers using simple programming models. It is designed to scale up from single services to thousands of machines, each offering local computation and storage.



It is evidently true that library data could be treated as big data without doubt due to its property of large volume; high velocity and obvious variety even though, they are often less organized, lacking of standards and unique formats (Wang, Chen, Xu, & Chen, 2016). However, they went further and stated that library big data is different from the data the other fields such as hospitals, business, manufacturers, banks etc. Library data emerged when structured and unstructured data of user visitation, books consultation, loan, renewals, location, digitalized books, CDs, books, journals etc. are analysed for better forecasts for future library planning usage of systems and resources, and productivity gain with better decision-making. According to Harper & Oltmann, (2017) Big data can have a positive effect when looking at the macro level of the library, rather than the individual user, when examining big data at the macro level in library and information settings, big data can examine patterns of use for materials, such as how often materials are checked out and which materials are the most popular or underutilized. This data can assist library and information professionals to know which materials can be weeded and which materials should stay in circulation

Li et al. (2019) opine that few studies have been done relating libraries no big data. Therefore the question is, “Do libraries have big data at all?” Libraries have moved from the traditional setup where the only data generated by the Library Management System and resources were catalogued meticulously via a limited set of metadata. Nowadays, libraries now collect data from a variety of sources both structured and unstructured data and no longer focus on books, journals and catalogue data only (Ball, 2019). Library BD will bring some tremendous benefits to librarianship. Wu, Su, and Deng (2013), emphasized that big data could be used for decision-making. For instance, analysis of readers' behavior will help libraries understand the interests, preferences of their patrons, and borrowing patterns. The readers search queries will make libraries to take informed decisions about which books, journals, and other resources to acquire for their collections. Thus, ensuring they align with the needs and interests of their users, resource allocation, and service improvements (Borgman, 2015; Koltay, and Sándor, 2018).

3.0 Methodology and Design:

Quantitative research methodology was used using convenient sampling technique. This allows for flexibility in data collection, as participants are selected based on access, proximity, and /or availability. The instrument for data collection was questionnaire. Questionnaire was developed with Google form as the main instrument for data collection, and was administered via social media platforms where librarians were specifically the respondents for 21 days. The questionnaire was divided into six sections. Section one collected demographic data; section two collected data about librarians' level of awareness; section three collected data on librarians primary sources of information; section four collected data on librarians understanding of core characteristics of big data; section five collected data on librarians perception on big data; and section six collected data on anticipated challenges in academic libraries in Northern Nigeria. The data collected were analysis using descriptive statistics of frequency, percentages, mean, and standard deviation.



4.0 Presentation and Analysis of Data:

This section deals with presentation, analysis and interpretation of the data collected from the respondents.

4.1 Demographic Analysis of the Respondents

The demographic characteristics of the respondents captured from the study area includes name of the university library, gender distribution, designation, educational qualification, and years of working experiences of the respondents, were analysed in this section using the simple descriptive statistical analysis.

Table 4.1 Demographic Distribution

S/N	Variables	Response	Frequency`	Percentages
1	Name of University Library	Abdullahi Fodiyo Library Complex	3	2.8
		Bayero University Library	6	5.6
		Ibrahim Badamasi Babangida Library Complex	1	0.9
		Ramat University Library	5	4.7
		University Library, Federal University Kashere	5	4.7
		University of Jos Library	4	3.7
		ATBU Library	2	1.9
		Sule Hamma Library Complex	8	7.5
		Qatar Musuem Library, Doha	1	0.9
		SOT Library Complex	4	3.7
		NOUN Library	2	1.9
		Federal University Gusau Library	3	2.8
		Skyline University Nigeria Library	1	0.9
		Federal University Birnin Kebbi Library	1	0.9
		NBRRRI Central Library	2	1.9
		MAU Yola	2	1.9
		Nigeria Police Academy Wudil	2	1.9
		Vet. Library	3	2.8
		Abu Ali Library	2	1.9
		KHAIRUN Library	2	1.9
Federal University of Lafia	2	1.9		
FUD Library	2	1.9		
FUDMA Library	3	2.8		
Federal University Lokoja Library	1	0.9		
		Murtala Ramat Library, MAAUN	1	0.9



				Federal University Wukari Library	3	2.8
				University of Ilorin Library	1	0.9
				Arc. Muhammad Namadi Sambo Library,	2	1.9
				Bauchi State University		
				BOSU Library	2	1.9
				Bukar Abba Ibrahim University	2	1.9
				Benue State University	1	0.9
				Gombe State University Library	3	2.8
				Ibrahim Badamasi Babangida University	2	1.9
				Nassarawa State Univesity Library	3	2.8
				Sule Lamido University Library	2	1.9
				Umaru Musa Yar'adua University Library	3	2.8
				KASU Library	3	2.8
				Collage Library	1	0.9
				Al-Qalam University Library	2	1.9
				ADUSTECH Library	3	2.8
				Nigerian Defense Academy	1	0.9
				Al-Istiqama University Library	2	1.0
					107	100%
2	Gender	Male	93	86.9		
				Female	14	13.1
3	Designation	Assistant Librarian	16	14.9		
				Deputy University Librarian	2	1.9
				Higher Library Officer	10	9.3

***Corresponding Author: Rilwanu Adamu (June) 2024**
EDITION

MAIDEN



		Librarian I	19	17.8
		Librarian II	17	15.9
		Principal Librarian	1	0.9
		Principal Library Officer I	2	1.9
		Principal Library Officer II	2	1.9
		Senior Librarian	8	7.5
		Senior Library Officer	12	11.2
		Library Research Officer II	1	0.9
		Senior Research Officer	2	1.9
		Public Health Officer	2	1.9
		Library Specialist	3	2.8
		Head of Elibrary	2	1.9
		E-Librarian	1	0.9
		Lecturer I	1	0.9
		Lecturer II	1	0.9
		Graduate Assistant	2	1.9
4	Educational Qualification	First Degree	29	27.1
		Postgraduate Diploma	4	3.7
		Professional Masters	5	4.7
		Master's Degree	61	57.0
		Ph.D	8	7.5
5	Working Experience	1 - 5 years	29	27.1
6	- 10 years	32	29.9	
		11 - 15 years	25	23.4



16 - 20 years	20	18.7
21 and above	1	0.9

Table 4.1 shows the demographic distribution of the respondents. The name of university library shows there are forty-three (43) university libraries within northern Nigeria that participated in this study. The percentage of respondents from each university library ranges from 0.9% to 7.5%. The gender distribution shows that 93 (86.9%) of the respondents are males while 14 (13.1%) of the respondents are females. In respect of the respondents' designation distribution, it was discovered that there are 19 different carders of librarians that participated in this study with librarian I with high percentage 19 (17.8%) and followed by others.

Moreover, on the educational qualifications 61 (57%) of the respondents possessed masters' degree, followed by 29 (27.1%) of the respondents possessed first degree while 8 (7.5%) possessed Ph.D. Also, 5 (4.7%) of the respondents obtained professional master's degree and only 4 (3.7%) possessed postgraduate diploma. On their working experiences, 32 (29.9%) of the respondents have been working for 6 - 10 years as a librarians in university libraries in Northern Nigeria. This is followed by 29 (27.1%) of the respondents have been working for 1 - 5 years. Also, 25 (23.4%) of the respondents have been working for 11 - 15 years while 20 (18.7%) of the respondents have been working for 16 – 20 years and lastly only 1 (0.9%) of the respondents have been working for 21 years and above.

Research Question 1: To what extent are librarians in Northern Nigerian university libraries are aware of big data technologies?

S/N	Awareness Statements	HA=4 Freq.	A=3 Freq.	LA=2 Freq.	NA=1 Freq. (%)	N=107	SD	Decision
							X	



Table 4.2 Mean responses of librarians' level of awareness on big data technologies university libraries in Northern Nigeria.

1	I am familiar with the term "big data" and its general meaning.				0(0)	3.15	.790	Highly Aware
2	I can identify some of the core characteristics of big data, such as volume, variety, and velocity.	16 (15.0)	59 (55.1)	32 (29.9)	0(0)	2.85	.655	Highly Aware
3	I am aware of different types of big data technologies used in various fields.	24 (22.4)	43 (40.2)	36 (33.6)	4(3.7)	2.81	.825	Lowly Aware
4	I can differentiate between big data and traditional data management methods.	31 (29.0)	34 (31.8)	31 (29.0)	11 (10.3)	2.79	.978	Lowly Aware
5	I have some understanding of how big data can be applied in the library context.	32 (29.9)	46 (43.0)	26 (24.3)	3 (2.8)	3.00	.812	Highly Aware
6	I am familiar with big data technologies like Hadoop, and Spark.	11 (10.3)	44 (41.1)	45 (42.1)	7 (6.5)	2.55	.767	Lowly Aware
		(%)	(%)	(%)				
		43 (40.2)	38 (35.5)	26 (24.3)				

Source: Field Survey (2024)

Note: N=107, HA = Highly Aware, A = Aware, LA =Lowly Aware, NA = Not Aware. N= Number of Questionnaire Retrieved. X= Mean, SD= Standard Deviation. Decision – weighted average 17.15/6 (Decision mean = 2.85)



Table 4.2 shows librarians’ level of awareness on big data technologies in university libraries in Northern Nigeria with the decision mean of 2.85. The data analysis shows that majority of the respondents with mean score of 3.15 (SD =.790) appeared to feel that they are familiar with the term "big data" and its general meaning. Also, majority of the respondents with mean score of 2.85 (SD =.655) felt that they can identify some of the core characteristics of big data, such as volume, variety, and velocity. Another set of the respondents with mean score of 3.00 (SD =.812) were also highly aware of how big data can be applied in the library context.

On the other hand, respondents with mean score of 2.81 (SD =.825) had lowly awareness on different types of big data technologies used in various fields. The respondents with mean score of 2.79 (SD =.978) expressed lowly awareness on how to differentiate between big data and traditional data management methods. Also, respondents with mean score of 2.55 (SD =.767) had lowly awareness on big data technologies like Hadoop, and Spark.

This implies that the general level of awareness is good as most librarians seems to be familiar with the term “big data” and its core characteristics. There is also a decent understanding of how big data could be used in libraries. However, they might need training on specific technologies and how they differ from traditional methods.

Research Question 2: What are the primary sources of librarians’ information regarding big data technologies in university libraries in Northern Nigeria?

Respondents were asked to indicate their primary sources of information regarding big data technologies using multiple choice options. Table 4.3 present the respondents responses.

Table 4.3: Primary of Sources of Information

S/N	Statement on Sources of Information	F	%	Rank	Source: Field Survey (2024)
1	Professional library conferences and workshops on big data.	63	58.8	1 st	Table 4.3 shows primary sources of librarians’ information regarding big data
2	Online courses or webinars on big data technologies.	56	52.3	2 nd	
3	Library literature and journals discussing big data applications.	47	43.9	3 rd	
4	Technology publications or websites.	46	42.9	4 th	
5	Training provided by library administration.	24	22.4	6 th	
6	Collaboration with IT departments on campus.	33	30.8	5 th	
7	Social Media like facebook, whatups and telegram.	63	58.8	1 st	
8	Other (Please Specify): _____	19	17.7	7 th	

technologies in university libraries. As shown in table, more than half 63 (58.8%) of the respondents indicated that they got information regarding big data technologies from professional library conferences, workshops and through the use of social media like facebook, whatups and



telegram. Equally, more than half 56 (52.3%) of the respondents got information on big data

technologies via online courses or webinars.

On the other hand, less than half 47 (43.9) of the respondents got their information from library literature and journals discussing big data applications. This is followed by 46 (42.9%) of the respondents got information through technology publications or websites. Also, 33 (30.8%) of the respondents got information via collaboration with IT departments on campus while 24 (22.4%) of the respondents got information through training provided by library administration. Only 19 (17.7 %) got their information via other means.

This implies that social media, professional events, online courses, and webinars are top sources where librarians got information about big data technologies. The analysis suggests librarians are actively seeking out information on big data technologies, but there are areas for improvement.

Research Question 3: How well do librarians understand the core characteristics of big data technologies (volume, variety, velocity, veracity, value) in university libraries in Northern Nigeria?

Table 4.4 Mean responses on the librarians’ understanding the core characteristics of big data university libraries in Northern Nigeria.

S/N	Core Characteristics Statements	SA=4 Freq. (%)	A=3 Freq. (%)	N=2 Freq. (%)	SD=1 Freq. (%)	N=107 X	SD	Decision
1	Big data typically refers to datasets that are extremely large and complex, exceeding the capacity of traditional data management tools.	64 (59.8)	40 (37.4)	3 (2.8)	0(0)	3.57	.551	Accepted
2	Big data encompasses a wide range of data formats, including structured (e.g., databases), semistructured (e.g., logs), and unstructured data (e.g., social media text).	49 (45.8)	55 (51.4)	3 (2.8)	0(0)	3.42	.551	Accepted
3	Big data is generated and collected at an ever-increasing rate, requiring real-time or near realtime processing for valuable insights.	31 (29.0)	58 (54.2)	18 (16.8)	0(0)	3.12	.668	Not Accepted
4	The accuracy and reliability of big data can be a challenge due to potential inconsistencies and errors within the data sources.	45 (42.1)	54 (50.5)	8 (7.5)	0(0)	3.34	.615	Not Accepted



5	Big data holds immense potential for generating valuable insights and improving decision-making in various contexts, including libraries.	45 (42.1)	50 (46.7)	12 (11.2)	0(0)	3.30	.664	Not Accepted
---	---	-----------	-----------	-----------	------	------	------	--------------

Source: Field Survey (2024)

Note: N= 107, SA = Strongly Agreed, A = Agreed, N = Neutral, SD = Strongly Disagreed, N= Number of Questionnaire Retrieved, X=Mean, SD=Standard Deviation. Decision – weighted average 16.75/5 (Decision mean = 3.35)

Table 4.4 shows librarians’ understanding on the core characteristics of big data technologies such as volume, variety, velocity, veracity, value in university libraries in Northern Nigeria with the decision mean of 3.35. The data analysis shows that majority of the respondents with mean score of 3.57 (SD =.551) agreed that big data typically refers to datasets that are extremely large and complex, exceeding the capacity of traditional data management tools. This is followed by respondent with mean score of 3.42 (SD = .551) agreeing that big data encompasses a wide range of data formats, including structured (e.g., databases), semi-structured (e.g., logs), and unstructured data (e.g., social media text).

On the contrary, respondents with mean of score 3.12 (SD= .668) not agreed that, big data is generated and collected at an ever-increasing rate, requiring real-time or near real-time processing for valuable insights. Also, respondents with mean score of 3.43 (SD= .615) not agreed that, the accuracy and reliability of big data can be a challenge due to potential inconsistencies and errors within the data sources. The respondents with mean score of 3.30 (SD =.664) not agreed that, big data holds immense potential for generating valuable insights and improving decision-making in various contexts, including libraries.

Based on the analysis of Table 4.4, librarians in university libraries have a good understanding of two core characteristics (volume and variety) of big data technologies while there are some misconceptions or areas where knowledge is lacking, particularly regarding the speed, accuracy, and value of big data.

Research Question 4: How do librarians perceive the potential of big data technologies for enhancing service delivery in university libraries in Northern Nigeria?

Table 4.5 Mean responses of librarians’ perception on the potential of big data technologies for enhancing service delivery in university libraries in Northern Nigeria.

S/N	Perception Statements	SA=4 Freq. (%)	A=3 Freq. (%)	N=2 Freq. (%)	SD=1 Freq. (%)	N=107 X	SD	Decision
1	Big data technologies have the potential to significantly improve resource collection and management in university libraries.	60 (56.1)	43 (40.2)	0(0)	4 (3.7)	3.48	.691	Accepted



2	Big data can be used to analyze user behavior patterns and personalize library services for students and faculty.	47 (43.9)	47 (43.9)	9 (8.4)	4 (3.7)	3.28	.774	Not Accepted
3	Big data analytics can enhance information retrieval capabilities and provide more relevant search results to library users.	52 (48.6)	47 (43.9)	8 (7.5)	0(0)	3.41	.628	Not Accepted
4	Big data can help university libraries optimize space allocation and resource accessibility based on user needs.	62 (57.9)	45 (42.1)	0(0)	0(0)	3.57	.495	Accepted
5	Overall, big data offers a powerful tool for university libraries to revolutionize service delivery and user experience.	57 (53.3)	45 (42.1)	1 (0.9)	4 (3.7)	3.44	.703	Accepted

Source: Field Survey (2024)

Note: N= 107, SA = Strongly Agreed, A = Agreed, N = Neutral, SD = Strongly Disagreed, N= Number of Questionnaire Retrieved, X=Mean, SD=Standard Deviation. Decision – weighted average 17.18/5 (Decision mean = 3.43)

Table 4.5 shows how librarians perceive the potential of big data technologies for enhancing service delivery in university libraries in Northern Nigeria with the decision mean of 3.43. The data analysis shows that majority of the respondents with mean score of 3.57 (SD =.495) agreed that big data can help university libraries optimize space allocation and resource accessibility based on user needs. This is followed by respondent with mean score of 3.48 (SD = .691) also agreed that big data technologies have the potential to significantly improve resource collection and management in university libraries. Also, respondents with mean score of 3.44 (SD = .701) equally agreed that big data offers a powerful tool for university libraries to revolutionize service delivery and user experience. On the contrary, respondents with mean of score 3.41 (SD= .628) do not accept that big data analytics can enhance information retrieval capabilities and provide more relevant search results to library users. Similarly, respondents with mean score of 3.28 (SD= .774) do not agreed that big data can be used to analyze user behavior patterns and personalize library services for students and faculty.

A majority of librarians agreed that big data have the potential of optimizing space allocation and resource accessibility, improving resource collection and management, and belief in service delivery transformation. However, there seems to be less agreement on some aspects such as enhancing information retrieval and personalizing library services. This suggest the need for more information or training to fully understand its practical applications for enhancing library services.



Research Question 5 What challenges do librarians anticipate in integrating big data technologies into their work practices in university libraries in Northern Nigeria?

Table 4.6 Mean responses of librarians on the anticipated challenges for integrating big data technologies in university libraries in Northern Nigeria.

S/N	Challenges Statements	SA=4 Freq. (%)	A=3 Freq. (%)	N=2 Freq. (%)	SD=1 Freq. (%)	N=107	X	SD	Decision
1	Lack of technical expertise among librarians to utilize big data tools.	54 (50.5)	53 (49.5)	0(0)	0(0)		3.50	.502	Accepted
2	Inadequate data security and privacy measures when dealing with big data in libraries.	43 (40.2)	51 (47.7)	6 (5.6)	7 (6.5)		3.21	.824	Not Accepted
3	Insufficient funding and resources to invest in big data infrastructure and training for librarians.	63 (58.9)	35 (32.7)	4 (3.7)	5 (4.7)		3.45	.780	Accepted
4	Compatibility issues between existing library systems and big data technologies.	58 (54.2)	39 (36.4)	6 (5.6)	4 (3.7)		3.41	.764	Accepted
5	Difficulty in interpreting and analyzing large and complex big data sets for library applications.	31 (29.0)	60 (56.1)	16 (15.0)	0(0)		3.14	.650	Not Accepted
6	Ethical considerations surrounding user data collection and usage within libraries for big data analytics.	28 (26.2)	57 (53.3)	22 (20.6)	0(0)		3.05	.684	Not Accepted

Source: Field Survey (2024)

Note: N= 107, SA = Strongly Agreed, A = Agreed, N = Neutral, SD = Strongly Disagreed, N= Number of Questionnaire Retrieved, X=Mean, SD=Standard Deviation. Decision – weighted average 19.76/6 (Decision mean = 3.29)

Table 4.6 shows what challenges do librarians anticipate in integrating big data technologies into their work practices in university libraries in Northern Nigeria with the decision mean of 3.29. The data analysis shows that majority of the respondents with mean score of 3.50 (SD =.502) agreed that lack of technical expertise among librarians to utilize big data tools is a challenge.

This is followed by respondent with mean score of 3.45 (SD = .780) agreed that insufficient funding and resources to invest in big data infrastructure and training for librarians is a challenge. Respondents with mean score of 3.41 (SD = .764) equally agreed that compatibility issues between existing library systems and big data technologies is a challenge. On the other hand, respondents with mean score of 3.21 (SD = .824) consider inadequate data security and privacy measures when dealing with big data in libraries as less concern challenge. Also respondents with mean score of 3.14 (SD = .650) consider difficulty in interpreting and analyzing large and complex big data sets for library applications as less concern challenge. Respondents with mean score of 3.05 (SD =

***Corresponding Author: Rilwanu Adamu (June) 2024**
EDITION

MAIDEN



.684) consider ethical considerations surrounding user data collection and usage within libraries for big data analytics as less concern challenge. This implies that librarians feel that biggest challenges are the lack the technical skills required to utilize big data tools effectively, limited funding for big data infrastructure and librarian training, and compatibility issues between existing library systems and big data technologies could create challenges in data integration and utilization. However, librarians seem less worried about data security and privacy measures, possibly indicating some existing knowledge or trust in their library's data handling practices. They are less concerned about interpreting complex data sets, perhaps because they have strong research skills or believe they can acquire necessary training. Also they seem least worried about ethical issues surrounding user data collection. This might suggest a need for more awareness or education in this area.

5.0 Summary of findings:

The study findings revealed that:

1. Findings revealed that, librarians are highly aware of the concept of big data technologies and it's potential to transform library services. However, they may need more awareness on how to use big data technologies in their work. This could include awareness on how to identify and select the right big data tools for a particular task, as well as how to use those tools to collect, store, analyze, and visualize big data.
2. Findings revealed that, librarians' primary sources of getting information regarding big data technologies are through social media, professional events, online courses, and webinars which suggests a preference for interactive, social learning, and self-directed learning options. Thus, there is need for more diversifying learning sources in addition to fostering collaboration and investing in internal training.
3. Findings revealed that, librarians in university libraries have a good understanding of only two core characteristics (volume and variety) of big data technologies while there are some areas where librarians' knowledge could be improved, particularly regarding velocity, veracity and value of big data.
4. Findings revealed that librarians recognize the potential of big data for optimizing resource management and accessibility, improving resource collection and management, and improving overall service delivery. However, there seems to be less agreement on some aspects: enhancing information retrieval and personalizing library services. This suggest the need for more information or training to fully understand its practical applications for enhancing library services.
5. Findings revealed that, the biggest challenges librarians anticipate for integrating big data technologies in university libraries could be lack the technical skills required to utilize big
- 6.



-
7. data tools effectively, limited funding for big data infrastructure and librarian training, and compatibility issues between existing library systems and big data technologies.

7.1 Conclusion:

It is concluded that, librarians are highly aware of the concept of big data technologies and its potentials but they need more awareness on how to use big data technologies in their work. Also the main sources of their awareness are through social media, professional events, online courses and webinars. Additionally, the biggest challenges librarians anticipate for integrating big data technologies in University libraries is lack of technical skills required to utilize big data tools effectively.

7.2 Recommendations:

Based on the findings of the study, the following recommendations were made:

1. There is need for more enlightenment programs focused on applying big data technological tools in university libraries.
2. There is need for university libraries to pay more attention to the interactive, social learning, and self-directed learning options besides fostering collaboration and investing in internal training.
3. There is need to create more awareness programs for librarians on how big data is being collected and generated with an ever increasing velocity, veracity, and value.
4. There is need to organize training exercise on how big data can be used to analyze user behavior patterns and personalize library services, enhance information retrieval capabilities and provide more relevant search results to library users.
5. There is need for libraries to provide training programs that will address the librarians anticipated challenges of technical skills, limited funding and compatibility issues surrounding big data technologies.



References

- A.Kaladhar, Naick, B. D., & Rao, K. S. (2018). Application of Big Data Technology to Library data:A review. *International Journal of Library and Information Studies*, 8(2), 1-6.
- Ball, R. (2019). Big Data and Their Impact on Libraries. *American Journal of Information Science and Technology*, 3(1), 1-9. doi:10.11648/j.ajist.20190301.11
- Bamigbola, A. A. (2023). BIG DATA” Revitalizing Librarianship: Impact On Librarians. *Library Philosophy and Practice (e-journal)*. 7988, 1-14.
- CBR. (2019, July 22). *Ten of the most popular big data tools for developers*. Retrieved from Computer Business Review: <http://www.cbronline.com/news/big-data/analytics/10-of-the-most-popular-big-data-tools-for-developers-4570483>
- Chigwada, J. P., & Kasiroori, J. (2021). Awareness of Big Data Usage and Applications Among Librarians in Zimbabwe In S. Dhamdhere (Ed.), *Big Data Applications for Improving Library Services*. *IGI Global*, 22-34.
- Harper, L. M., & Oltmann, S. M. (2017). Big Data’s Impact on Privacy for Librarians and Information Professionals. *BULLETIN OF THE ASSOCIATION FOR INFORMATION SCIENCE AND TECHNOLOGY*, 43(4), 1-7.
- Jharotia, A. K. (2019). Big Data Technology: Big Opportunity for Librarians. *Tecnia Institute of Advace Studies*, 1-7.
- Jiao, L. S., Zhang, F., & Xu, Y. X. (2019). Problems and changes in digital libraries in the age of big data from the perspectives of user services. *services.Journal of Academic Librarianship*, 22–30.
- King, D. L. (2018, December 13). *social media | emerging trends | libraries*. Retrieved from emerging technology trends and libraries. : <https://www.davidleeking.com/big-data-andlibraries/>
- Laney, D. (2001). *3-D Data Management: Controlling Data Volume, Velocity and Variety*. META Research Note.
- Lathan, J. (2020, July 5). *University of San Diego*. Retrieved from STEAM Education: A 21st Century Approach to Learning: <https://onlinedegrees.sandiego.edu/steam-education-inschools/>



-
- Stephen Kaisler, F. A. (2012). Big Data: Issues and Challenges Moving Forward. *46th Hawaii International Conference on System Science* (pp. 1-14). Hawaii: IEEE.
- Wang, C., Chen, L., Xu, S., & Chen, X. (2016). Exposing Library Data with Big Data Technology: A Review. *ResearchGate*, 1-7.
- Wikipedia. (2019, July 20). Retrieved from www.wikipedia.com
- Zhan, M., & Gunilla Widén. (2018). Public libraries: roles in Big Data. *The Electronic Library*, 36(1), 1-5.