Emerging Technology Services Provided by Nigerian Library and Information Science Professionals

Siddiqah Olatope Oyedokun
Olabisi Onabanjo University Library, Ogun State, Nigeria
Email: oyedokun.siddiqah@oouagoiwoye.edu.ng

Adebambo A. Oduwole
Lagos State University, Ojo, Lagos State, Nigeria

Abiodun O. Odunewu
Olabisi Onabanjo University Library, Ogun State, Nigeria

Sowemimo Ronke Adekunmisi
Olabisi Onabanjo University Library, Ogun State, Nigeria

Abstract

Emerging technologies are revolutionizing practically every area of human endeavor. This invention has resulted in a significant shift in the way libraries operate all around the world. Recent library technologies, which varied from library 1.0 to library 5.0, provide evidence of this. It is anticipated that this breakthrough will draw the tech-savvy generation to the library; sadly, in Nigeria, the opposite is evident. Based on this, the study looked at services based on emerging technologies that librarians and information scientists in Nigerian libraries provided. The study's population consisted of 45 attendees from the 2019 IT Section of the Nigerian Library Association Workshop, and it used a survey research design. Out of the 45 copies of the administered questionnaire that were recovered, only 38 were deemed relevant for the investigation. There were two sections to the questionnaire. Section B aimed to gather information on emerging library services offered and obstacles to their implementation, whereas Section A sought to clarify demographic data. The study's conclusions were computed using descriptive statistics. The survey found that practitioners provide a wide range of library services based on developing technology. According to the survey, there is a dearth of services based on emerging technologies, such as cloud computing, gaming, and the Internet of Things. The survey also found that among other difficulties, practitioners deal with erratic electricity and poor internet service provision. It was concluded that practitioners would maximize the use of emerging technologies if sufficient attention was given to the issues impeding their use in the delivery of library services. Recruitment of more personnel and provision of alternative power supplies were among the recommendations made in the study.

Introduction

Emerging technologies have had a significant role in changing a variety of industries in the rapidly developing digital era, including the area of library and information science (LIS). Nigerian LIS professionals have begun to offer cutting-edge services to address the changing information demands of their clientele after realizing the enormous potential of these technologies. Artificial intelligence (AI), blockchain, virtual reality (VR), and the Internet of Things (IoT), among other new technologies, have completely changed how libraries function and engage with their patrons (Aina, 2019). Virtual reality has the potential to develop immersive learning environments and collaboration spaces in libraries (Onyancha, 2021). Libraries may provide virtual tours, interactive exhibitions, and simulations that improve information retrieval, research, and teaching by incorporating virtual reality technology (Aina, 2019).

The Internet of Things has made it possible for libraries to offer linked and smart services. To speed up lending and returning procedures, IoT devices like RFID tags and sensors could be used to augment collection management and supply real-time data on library usage (Adetimirin, 2019). By reducing manual involvement and ensuring optimal resource allocation, this connection improves the user experience across the board in the library setting (Onyancha, 2021). Emerging technology also includes the use of cutting-edge technology to digitize and make accessible a variety of textbooks, academic journals, and other intellectual resources (Adetimirin, 2019) to increase possibilities for continuing learning by making access to these resources easier (Onyancha, 2021). The adoption of artificial intelligence (AI) is now necessary for libraries to provide emerging library services effectively (Yusuf, Adebayo, Bello, & Kayode, 2022). The application of AI to perform library tasks and services will reduce human errors due to the repetitiveness of library tasks (Ajani, *et al.,,* 2022).

From the foregoing, it is apparent that the use of emerging technologies for service delivery in the library has magnificent benefits. However, it appears that the provision of emerging technology services in Nigeria is still in its infancy, despite the increased use of emerging technologies by Library and Information Science (LIS) professionals throughout the world to provide novel services. Empirical studies that could ascertain the emerging technology services provided among LIS professionals in Nigeria are lacking because much of the literature on the topic surveyed discusses the application of emerging technology rather than the extent of its provision. Meanwhile, there is a need to identify emerging technology services delivered by LIS professionals in Nigeria to know the limit so far reached and to shift the frontier forward. On this note, this study is set to investigate emerging technology services provided by LIS professionals in Nigeria as well as to ascertain the challenges that could debar their provision. The objective of this study is to identify emerging technology library services provided and challenges to their provisions among Nigerian LIS professionals.

Emerging technologies are changing the face of service delivery in manufacturing and service provision organizations. The technologies have proven to be of immense benefit to production and service delivery worldwide. Libraries, as service agents, have their fair share of emerging technologies that can be exploited for their service delivery. Libraries that fail to adopt the technologies for their services will become obsolete and lose their target users, particularly the techno-savvy generation. The digital divide and inadequate infrastructural provision have put developing countries at a disadvantage compared to developed countries (Chang *et al.,* 2015). However, these challenges do not discourage LIS professionals in Nigeria from being exposed to emerging technologies. In this present age, it is essential to deliver library services with

215

emerging technology to gain more users and retain existing ones in libraries. There is low patronage of clients in the libraries, which could result from libraries not adopting emerging technology services and many other factors (Alegbeleye, Madukoma, and Dahunsi, 2020). It is envisaged that the delivery of emerging technology services in libraries in Nigeria could increase library patronage both physically and virtually. Based on the assumption that emerging technology-driven library services will encourage patronage, This study investigates the need to identify emerging technology services delivered by LIS professionals in Nigeria to discover the limit reached and shift the frontier.

Research Objectives

Specifically, this study is to investigate the following:

1. To identify the emerging technology library services provided by library and information professionals in Nigeria and
2. Investigate challenges to the provision of emerging technology library services among library and information science professionals in Nigeria.

Research Questions

1. What are the emerging technology library services provided by library and information professionals in Nigeria?
2. What are the challenges to the effective provision of emerging technology library services among library and information professionals in Nigeria?

Literature Review

Concept of Emerging Technology in the Libraries

Libraries have witnessed tremendous transformation as a result of emerging technology, which is eradicating the era of traditional methods of service delivery in developing countries like Nigeria. Emerging technology is a term used to describe novel and evolving technologies that have the potential to have a substantial influence on many organizations, such as libraries. Emerging technologies are tools to expedite user-driven service delivery and are suitable to meet users' demands with quality assurance (Olowofila, 2019). There are many emerging technologies that libraries may use to support user services, education, library management, and technical services. According to Ibrahim (2021), emerging technologies for service delivery in libraries are RFID, communication technologies, electronic information resources, makerspace, cloud computing, social networking sites, video conferencing, and integrated library systems. Adoption and usage of emerging technology for service delivery in libraries could enhance the relevancy of the library, promote loyalty, accelerate communication, and save cost and time (Mahmood & Richardson, 2013). From the foregoing, literature has established that emerging technologies have changed the face of service delivery in libraries, as they have led to enhanced user services, library education, library management, and technical services.

Siddiqah Olatope Oyedokun; Adebambo A. Oduwole; Abiodun O. Odunewu & Sowemimo Ronke Adekunmisi

Professionals in the LIS field globally have embraced emerging technologies and are using AI to automate repetitive operations like cataloging and circulation so that librarians may focus more of their time on providing individualized user help (Ajiboye, 2020). The security and validity of digital materials could be improved with blockchain technology while ensuring transparent and unchangeable transactions inside library systems (Adetimirin, 2019). Yakubu, Yagana, and Umar (2023) adopted the Theory of Planned Behaviour to assess factors that could determine the intention to use emerging technology, such as artificial intelligence for effective service delivery among a population of 242 professionals and para-professional librarians from 3 Federal university libraries in the North-Eastern part of Nigeria. A proportionate stratified random sampling technique was used to draw 119 personnel, and Partial Least Square – Structural modeling was used to compute the result of the study. Findings show that variables of the theory have a positive and significant impact on the personnel's intention to use emerging technology for service delivery in their libraries and that the respondents' intention to use the technology is high.

Provision of Emerging Technology in the Library Services
Ajani *et al.,* (2022) investigate the awareness and eagerness of academic libraries towards the utilization of artificial intelligence (AI) for task performance and service delivery, with one academic library representing each of the six geopolitical zones across Nigeria with open-ended structural questionnaire through the mail to the respondents. The results of the study were computed using thematic analysis, and the findings revealed that the respondents are aware of AI tools, that there is a different perception of readiness for AI among the respondents, and that the adoption and use of Al in the Nigerian context is not encouraging as it operates around the globe. Ogunmodede *et al.,* (2021) investigate the level of innovation among librarians in Nigerian federal universities and find that innovation among the respondents is high, with an average score of 86.6 out of 120. These findings point to librarians' awareness and readiness to use emerging technologies.

Tiwari (2016) assessed 68 library users' level of satisfaction with the Mohinder Singh Randhawa Library's level of deployment of emerging services and documented a very high level of adoption and deployment of innovative services, with the users being highly satisfied with the library's services. Findings indicated that 89.70% of the respondents were excellently satisfied with the Internet facilities provided; 85.29% were excellently satisfied with document delivery as well as OPAC/Web OPAC services; and 66.18% were satisfied with interlibrary loan services. Further, 35.29% were excellently satisfied with Web 2.0, while 47.05% indicated they were very satisfied with Web 2.0. However, 64.70% of the respondents were fairly satisfied with the audio-video facility, while 50.00% were fairly satisfied with the current awareness services of the library. Emezie (2018) reveals how a Nigerian federal university library used emerging services and practices to step up the library's visibility, library patronage, library database usage, library research, OPAC usage, and the library personnel's zealousness to serve, amongst other services. This suggests that the emerging services are useful and appreciated.

Antivirus (2018) examined the usage of ICT to support emerging library services among 58 personnel of the University of Dar es Salaam Wilbert Chagula Library. The study reported virtual desk services (72.5%), followed by the provision of electronic resources and databases (70.0%), as the most emerging services performed by the personnel. Chat with a librarian (65.0%), literature searches (52.5%), and QR code access to resources (50.0%), ask a librarian (27.5%), and institutional repository (22.5%) are the other emerging services embarked upon

217

with respect to ICT usage. Amuda and Adeyinka (2017), in a study involving 354 library staff, assessed social media use for innovative library services in 36 university libraries in Southwestern Nigeria and discovered a remarkable level of deployment of social media tools to library services, with Facebook being the most utilized site among the personnel. The findings reported further that library personnel commonly utilize social media tools to communicate with library users, render reference services, and disseminate information, including news on library services to their clientele.

Mbagwu (2022) examined the websites of the 49 Federal universities in Nigeria to identify the emerging technology services offered through library portals and found that 12 university libraries in Nigeria lacked official websites. Of the remaining 37 libraries, only 3 university libraries displayed 7 out of the 23 innovative services on their websites. This finding exposes the weakness of library websites as it concerns emerging services. Emiri (2023) investigated how 704 librarians from university libraries in Southern Nigeria were using AI tools like face recognition, touch recognition, RFID technologies, AI classification tools, and machine-readable catalogs and found that these tools have not yet been adopted and used; this is another identified gap. Adeleke, Ojokuku, and Onaade (2022) investigated 48 university libraries in Nigeria and found that the libraries were not yet digitally mature, but they were e-enabled. The authors refer to digital maturity as the ability of the libraries to appropriately adopt and use emerging technologies for efficient innovative service delivery, effectively manage resources, and develop personnel digital skills.

Saibakumo (2021) evaluated awareness, adoption, preference, and readiness for emerging technology services in academic libraries in Nigeria. Among the eighteen emerging technologies of the study, only WebOPAC, library websites, Cybrary, social media, and institutional repositories were used by the respondents for service delivery. Others, such as artificial intelligence, virtual or augmented reality, cloud computing, and the Internet of Things are not in use. From the perspective of cataloging librarians (Tella, Oluwole, and Lawal, 2023) investigated the awareness, use, advantages, and challenges of AI among twenty-one catalogers from ten university libraries in Oyo State with qualitative methods and interviews as means of data collection. The study shows that all the respondents were aware of the application of AI for cataloging and classification through reading, but none of them utilized AI in the cataloguing and classification section. The benefits associated with the application of AI for cataloging and classification, according to the study, include enhancement of automatic cataloguing and classification using optical character recognition, reduction in work stress, speedy creation of metadata, and improved job performance with accuracy.

Challenges to Provision of Emerging Technology in Library Services

Challenges such as funding, inadequate experts, limited power supply, limited budget to procure the technology, and training personnel are likely problems that could antagonize the adoption of emerging technology in Nigeria (Ibrahim, 2021; Ajani *et al..,* 2022). Factors like unstable electricity, inadequate funds, and poor Internet connectivity constituted constraints on the library's emerging technology practices (Emezie, 2018). Asad, Mohamad, Khalid, & Saima (2017) utilize the unified theory of acceptance and use of technology (UTAUT) model to predict Pakistan's university librarians' intention to adopt digital reference services. The study established that usefulness, ease of use, and ICT skills were good determinants for the adoption

Siddiqah Olatope Oyedokun; Adebambo A. Oduwole; Abiodun O. Odunewu & Sowemimo Ronke Adekunmisi

of digital reference services, as the three variables jointly contributed to the sampled university librarians' intention to adopt digital reference services, accounting for 56.8% of its total variance. These identified items are germane for the efficient adoption of Web 2.0 services, and importantly, innovative library services, as a lack of any of these items may hinder the adoption of emerging technology services delivered in libraries.

Mwantimwa and Nkhoma-Wamunza (2016), in a study involving 40 librarians from UDSM and SUA libraries, reported that 26 (65.0%) of the respondents indicated support from top library management, improved ICT infrastructure (25) (62.5%), and improved knowledge and skills on the usage of emerging technologies (20) (50%) were very critical strategies for the adoption and usage of emerging technology services in the libraries. In addition, 11 (27.5%) signified sensitization of users on the potentials of emerging technology tools in library services; personalization of online public access catalogues (8) (20%); formulation of policies on Web 2.0 technologies (7) (17.5%); and provision of efficient Internet connectivity (3) (7.5%) were critical for the adoption of emerging technology in libraries. Librarians in Nigeria are prepared for emerging technologies and prefer the tools because of their usefulness in learning environments, but their implementation is restricted due to poor funding (Saibakumo, 2021). Tella et al. (2023) identify challenges to the application of AI in cataloguing and classification in Nigeria as poor funding, power outages, and technical know-how. The author reports further that there is no strategic planning for the adoption of AI for cataloguing and classification in academic libraries in Nigeria, even though the majority of the study participants would like to adopt AI for the task. However, 15% of the respondents are skeptical about the adoption of AI because of power outages and fear of job loss.

Methodology

A descriptive survey research design anchored this study with a population of 45 participants who attended the Information Technology (IT) Section's (a subset of the Nigeria Library Association) 2019 workshop held at Federal University, Lokoja. This group was targeted as they are the personnel in charge of applying emerging technologies to library services in libraries in Nigeria. A structured questionnaire comprising two sections was used to collect data for the study, which comprises three sections. Section A elicits data on the demographic profile of the respondents, while Section B contains 25 items on a Likert scale to elicit information on emerging library services provided and 22 items to measure impediments to the provision of emerging library services delivery. The instrument is weighted on a 1–4 value of not provided, slightly provided, moderately provided, and highly provided for Section B, and 1 - 5 of very low extent, low extent, moderate extent, high extent, and very high extent for Section C. A total of 38 fully completed and usable questionnaires with a response rate of 84% made up the analysis of this study. The analysis of the study was performed based on the formulated objectives using SPSS version 26, and the results were presented with frequency counts, simple percentages, means, and standard deviations.

Results

Table 1: Demographic profile of respondents

Dimension	Delineation	Freq.	(%)
Library Type	National	2	5.3
	Academic	26	68.4
	School	2	5.3
	Special	8	21.0
Total		**38**	**100.0**
Job Status	Library Officers	5	13.2
	Librarians	24	63.0
	Lecturers	5	13.2
	ICT Personnel	2	5.3
	Administrators	2	5.3
Total		**38**	**100.0**
Gender	Male	23	60.5
	Female	15	39.5
Total		**38**	**100.0**
Qualification	Diploma	5	13.2
	Bachelor	11	28.9
	Masters	16	42.5
	Ph.D.	6	15.8
Total		**38**	**100.0**
Age Group	21 – 25	3	7.9
	26 – 30	1	2.6
	31 – 35	7	18.4
	36 – 40	9	23.7
	41 – 45	6	15.8
	46 – 50	7	18.4
	50 $^+$	5	13.2
Total		**38**	**100.0**
Work Experience	1 - 5	6	15.8
	6 - 10	13	34.2
	11 - 15	7	18.3
	16 - 20	5	13.2
	21 - 25	3	7.9
	26 - 30	2	5.3
	30$^+$	2	5.3
Total		**38**	**100.0**

Table 1 shows the demographic profile of the study participants, which revealed that the majority (68.4%) were from academic libraries, with male dominance (60.5%). Masters degree (16 (42.51%) and 36–40 years (9 (23.7%), respectively, are the highest educational qualifications

and age groups of the majority. Likewise, 13 (34.2%) had between 6 and 10 years of experience, and 24 (63.0%) were professional librarians.

Research Question One: What are the emerging technology library services provided by library and information professionals in Nigeria?

Table 2: **Descriptive statistics showing emerging technology services provided by library and information science professionals in Nigeria**

Items on emerging services provided in the libraries	Not Provided	Slightly Provided	Moderately Provided	Highly Provided	$\bar{x}$	SD
Current awareness electronic mail services	4(10.5)	9(23.7)	14(36.8)	11(28.9)	2.84	0.97
Electronic / digital reference services	11(28.9)	6(15.8)	11(28.9)	10(26.3)	2.53	1.18
Online user education / information literacy programmes	6(15.8)	11(28.9)	12(31.6)	9(23.7)	2.63	1.03
Game centre for entertainment in the library	28(73.7)	4(10.5)	4(10.5)	2(5.3)	1.47	0.89
Social networking sites for library services	11(28.9)	5(13.2)	11(28.9)	11(28.9)	2.58	1.20
Cloud computing services	18(47.4)	5(13.2)	8(21.1)	7(18.4)	2.11	1.20
Library extension and outreach services	12(31.6)	6(15.8)	12(31.6)	8(21.1)	2.42	1.15
Publication and research support services	6(15.8)	7(18.4)	13(34.2)	12(31.6)	2.82	1.06
Electronic literature search services	5(13.2)	6(15.8)	15(39.5)	12(31.6)	2.90	1.01
Document delivery services	8(21.1)	7(18.4)	17(44.7)	6(15.8)	2.55	1.01
Indexing and abstracting services	8(21.1)	10(26.3)	15(39.5)	5(13.2)	2.45	0.98
Reprographic facilities	8(21.1)	8(21.1)	12(31.6)	10(26.3)	2.63	1.10
Bibliographic compilation services	6(15.8)	8(21.1)	18(47.4)	6(15.8)	2.63	0.94
Open data / open access services / open education resources	5(13.2)	9(23.7)	12(31.6)	12(31.6)	2.82	1.04
Blockchain technology	27(71.1)	2(5.3)	8(21.1)	1(2.6)	1.55	0.92
Online library tour / guide	13(34.2)	7(18.4)	11(28.9)	7(18.4)	2.32	1.14
Serials control and services	3(7.9)	4(10.5)	14(36.8)	17(44.7)	3.18	0.93
Data curation management	11(28.9)	10(26.3)	12(31.6)	5(13.2)	2.2	1.0

221

					9	4
Library portal / website	7(18.4)	5(13.2)	9(23.7)	17(44.7)	2.95	1.16
Bulletin board services	11(28.9)	7(18.4)	11(28.9)	9(23.7)	2.47	1.16
Library automation services	11(28.9)	3(7.9)	7(18.4)	17(44.7)	2.79	1.30
Online Public Access Catalogue	10(26.3)	3(7.9)	8(21.1)	17(44.7)	2.84	1.26
Internet of Things (IoTs)	18(47.4)	5(13.2)	8(21.1)	7(18.4)	2.11	1.20
Artificial Intelligent	13(34.2)	7(18.4)	11(28.9)	7(18.4)	2.32	1.14
Virtual / Augmented Reality	27(71.1)	2(5.3)	8(21.1)	1(2.6)	1.55	0.92

Table 2 gave insight into the 22 emerging library services identified and formed the focus of the study among library and information science professionals in Nigeria. Using 2.50 as a benchmark, the result demonstrated the following as the emerging library services provided: serial control ($\bar{x}$ = 3.18), library portal/website management ($\bar{x}$ = 2.95), electronic literature search ($\bar{x}$ = 2.90), online public access catalogue and current awareness electronic mail services ($\bar{x}$ = 2.84) are the most provided services. The emerging library services that are least provided are game centers for entertainment in the library ($\bar{x}$ = 1.47), virtual reality and blockchain technology ($\bar{x}$ = 1.55), and cloud computing services and IoTs ($\bar{x}$ = 2.11). By implication, the study revealed that services such as game centers, virtual reality, blockchain technology, cloud computing, Internet of Things, and data curation management were hardly rendered in Nigerian libraries. This finding establishes previous results (Antidius, 2018; Saibakumo, 2021; Mbagwu, 2022; Emiri, 2023) that existing emerging technology services were provided but not recent emerging technology services such as virtual reality, blockchain technology, cloud computing, and Internet of Things library services. The reason for this result could be that it takes longer for libraries in Nigeria to adapt to emerging technologies compared to their contemporaries in advanced countries, owing to the peculiarities of developing countries.

Research question two: What are the challenges to the effective provision of emerging technology library services among library and information professionals in Nigeria?
Table 3:   Descriptive statistics showing challenges to emerging technology services among library and information science professionals in Nigeria

Items on challenges to emerging services provided in the libraries	Very low extent	Low extent	Moderate extent	High extent	Very high extent	$\bar{x}$	SD
Inadequate knowledge of using web facilities to serve users	9(23.7)	11(28.9)	9(23.7)	5(13.2)	4(10.5)	2.58	1.29
Lack of Information and Communication Technology	10(26.3)	8(21.1)	12(31.6)	4(10.5)	4(10.5)	2.58	1.29

Emerging Technology Services Provided by Nigerian Library and Information Science Professionals

Siddiqah Olatope Oyedokun; Adebambo A. Oduwole; Abiodun O. Odunewu & Sowemimo Ronke Adekunmisi

literacy

Inadequate training on how to use emerging technology library services	8(21.1)	9(23.7)	7(18.4)	11(28.9)	3(7.9)	2.79	1.30
Inadequate computer skills	11(28.9)	7(18.4)	8(21.1)	8(21.1)	4(10.5)	2.66	1.38
Fear of technological appliances and use	14(36.8)	9(23.7)	9(23.7)	4(10.5)	2(5.3)	2.24	1.22
Lack of policy on emerging technology library service	8(21.1)	3(7.9)	15(39.5)	5(13.2)	7(18.4)	3.00	1.36
Lack of sponsorship to conference, workshop and seminar to update skills	7(18.4)	6(15.8)	8(21.1)	13(34.2)	4(10.5)	3.03	1.30
Lack of social media skill	13(34.2)	7(18.4)	7(18.4)	9(23.7)	2(5.3)	2.47	1.33
Lack of innovative / creative skills	12(31.6)	11(28.9)	6(15.8)	6(15.8)	3(7.9)	2.40	1.31
Lack of problem-solving skills	10(26.3)	10(26.3)	10(26.3)	5(13.2)	3(7.9)	2.50	1.25
Nonchalant attitude of library staff	9(23.7)	6(15.8)	9(23.7)	9(23.7)	5(13.2)	2.87	1.38
Inadequate information technology and resources	11(28.9)	5(13.2)	4(10.5)	6(15.8)	12(31.6)	3.08	1.67
Inadequate motivation packages	6(15.8)	6(15.8)	11(28.9)	7(18.4)	8(21.1)	3.13	1.36
Inadequate supervision and evaluation of services	6(15.8)	8(21.1)	12(31.6)	5(13.2)	7(18.4)	2.97	1.33
Work overload	2(5.3)	8(21.1)	11(28.9)	8(21.1)	9(23.7)	3.37	1.22
Unstable power supply	9(23.7)	5(13.2)	4(10.5)	7(18.4)	13(34.2)	3.26	1.62
Job insecurity	15(39.5)	6(15.8)	5(13.2)	5(13.2)	7(18.4)	2.55	1.57
Unconducive work environment	11(28.9)	6(15.8)	9(23.7)	5(13.2)	7(18.4)	2.76	1.48
Low internet bandwidth	5(13.2)	9(23.7)	7(18.4)	6(15.8)	11(28.9)	3.24	1.44
Poor environmental facilities	11(28.9)	5(13.2)	9(23.7)	5(13.2)	8(21.1)	2.84	1.52
Inadequate reading carrels and chairs	11(28.9)	7(18.4)	13(34.2)	1(2.6)	6(15.8)	2.58	1.37
Inadequate office furniture	8(21.1)	7(18.4)	13(34.2)	3(7.9)	7(18.4)	2.84	1.37

The result in Table 3 affirmed that few factors affect the provision of emerging library services among library and information service providers in Nigeria, which are work overload ($\bar{x}$ = 3.37), unstable power supply ($\bar{x}$ = 3.26), low internet bandwidth ($\bar{x}$ = 3.24), inadequate motivational

packages ($\bar{x}$ = 3.13), inadequate technology and resources ($\bar{x}$ = 3.08), lack of sponsorship for conferences, workshops, and seminars to update skills ($\bar{x}$ = 3.03), and lack of policy on emerging technology library service ($\bar{x}$ = 3.00). However, factors such as fear of technological appliances and use ($\bar{x}$ = 2.24), lack of innovative / creative skills ($\bar{x}$ = 2.40), lack of social media skills ($\bar{x}$ = 2.47), and lack of problem-solving skills ($\bar{x}$ = 2.50), among others, were not identified as challenges by the respondents. The finding corroborates prior studies (Emezie, 2018; Ibrahim, 2021; Tella, et al. 2023).

Conclusion

This study sets out to investigate the emerging technology-based services provided by libraries and information in Nigeria and the challenges they face in providing the services. The study found that a wide range of emerging technology-based library services are provided by library and information professionals in Nigeria. These services include serial control, library portal/website management, electronic literature searching platforms, online public access dialogue (OPAC), and current awareness services. However, the study established low-emerging technology-based services in the areas of gaming, cloud computing, and the Internet of Things, as well as artificial intelligence, virtual reality, and blockchain technology-based services. The study also established that several challenges are faced in the provision of emerging technology-based library services. The challenges, among others, include unstable electricity supply, poor internet, inadequate technology and resources, a lack of training and re-training of library staff, as well as a lack of statutory policies on emerging technology use for library service delivery. These findings align with the findings of some previous studies (Ibrahim, 2021; Ajani et al., 2022; Emezie, 2018; Asad et al., 2017).

This study concludes that library and information professionals in Nigeria are aware of the existence of emerging technologies and are using them to provide library services. It is envisaged that where factors (such as inadequate electricity, internet, training, etc.) impending or hindering the effective application of emerging technologies to library service delivery in Nigeria are properly addressed, librarians and other information professionals will seamlessly exploit and maximise the use of the emerging technologies in library service delivery.

Recommendations
- Library management should, as a matter of urgency, conduct a job schedule analysis, and where personnel are burdened with work overload, the library should recruit more personnel.
- Unstable power supplies could be demoralising and negatively affect job output. Library management should exploit alternative power generation to ensure a stable electricity supply.
- Low or non-motivation could reduce staff commitment; library management should devise means of motivating their staff towards quality service delivery.
- Libraries are technology-driven, and as such, quite a number of library routines rely on constant internet provision. Library management should engage various Internet Service Providers and choose the one that will suit their Internet needs.
- Attendance at conferences, workshops, and seminars enhances library staff's performance. Library management should, as such, ensure regular sponsorship of their staff for conferences, seminars, and workshops.

Siddiqah Olatope Oyedokun; Adebambo A. Oduwole; Abiodun O. Odunewu & Sowemimo Ronke Adekunmisi

References

Adetimirin, A. (2019). Blockchain technology in libraries: Enhancing security and transparency. Journal of Library Innovation, 2(1), 15-28.

Aina, L. O. (2019). Libraries, information science education and the fourth industrial revolution in Africa. Journal of the National Institute of Library and Information Science, 4(2), 45-60.

Ajani, Y. A., Tella, A., Salawu, K. Y. & Abdullahi, F. (2022). Perspectives of Librarians on Awareness and Readiness of Academic Libraries to Integrate Artificial Intelligence for Library Operations and Services in Nigeria, *Internet Reference Services Quarterly*, 26(4), 213-230. https://doi.org/10.1080/10875301.2022.2086196.

Ajiboye, A. (2020). Leveraging emerging technologies for library services: A case study of Nigerian LIS professionals. International Journal of Library Science, 7(1), 25-39.

Alegbeleye, G. O., Madukoma, E., & Dahunsi, F. T. (2020). Library collection quality and library patronage of academics in South-West, Nigeria. International Journal of Social Sciences and Humanities Review, 10(1), 62-80

Amuda, H. O. & Adeyinka, T. (2017). Application of social media for Innovative Library Services in South-Western Nigerian University Libraries. *Journal of Balkan Libraries Union,* 5(2), 10-16.

Chan, L. Y., Kim, H., Wang, S. F. & Park, M. C. (2015). A comparison of the digital divide across three countries with different development indices. *Journal of Global Information Management,* 23(4), 55-76.

Emiri, O. T. (2023). Adoption and Utilisation of Artificial Intelligence by Librarians in University Libraries in Southern Nigeria. *Library Philosophy and Practice (e-journal).* 7570. https://digitalcommons.unl.edu/libphilprac/7570

Emezie, N. (2018). Stepping up the ladder to meet user needs: Innovative library services and practices in a Nigerian university of technology. *Library Philosophy and Practice (e-journal).* Paper 1767.

Ibrahim, A. B. (2021). Leveraging Emerging Technology for Public Library Service in Nigeria. *Al-Hikmah Journal of Educational Management and Counselling,* 3(1), 213-222.

Mbagwu, F. C. (2022). Catching Up with Innovation and Trends in University Library Services in Nigeria: An Analytical Study of University Library Websites in Nigeria. *Library Philosophy and Practice (e-journal).* 7093. https://digitalcommons.unl.edu/libphilprac/7093

Mahmood, K. & Richardson Jr., J. V. (2013). Adoption of web 2.0 in U.S. academic libraries: A survey of ARL library websites. *Program: Electronic Library and Information Systems* 45(4) 365-375. https://doi.org/10.1108/00330331111182085.

Mwantimwa, K. & Nkhoma-Wamunza, A. (2016). Perception on Adoption and Application of Web 2.0 Technologies in Selected Academic Libraries in Tanzania. *University of Dar es Salaam Library Journal,* 11(2), 17-30.

Ogunmodede T. A. and Popoola, S. O. (2021). Librarians' Innovation in the Federal Universities in Nigeria. *Journal of Balkan Libraries Union,* 8(1), 33-41.

Okoroma, F. N. (2023). The Level of Awareness, Knowledge and Perception of Linked Data by Library and Information Science Professionals in Nigeria. *Transactions on Engineering and Computing Sciences*, *11*(3), 73–87. https://doi.org/10.14738/tecs.113.14710

Olowofila, M. O. (2019). Creativity and innovation in library and information services in the 21st century: A review. *Nigeria Communication &Information Technology Journal*, 1(1),

Onyancha, O. B. (2021). Virtual reality in Nigerian libraries: Expanding access and enhancing user engagement. Journal of Information Science and Technology, 8(3), 72-89.

Saibakumo, W. T. (2021). Awareness and acceptance of emerging technologies for extended information service delivery in academic libraries in Nigeria. *Library Philosophy and Practice (e-journal)*. 5266. https://digitalcommons.unl.edu/libphilprac/5266.

Telle, A., Oluwole, A. O. & Lawal, W. O. (2023). Cataloguing and classification in the era of artificial intelligence, benefits, and challenges from the perspective of cataloguing librarians in Oyo State, Nigeria. Vjesnik bibliotekara Hrvatske 66, 1(2023), 159–176.

Tiwari, K. (2016). Librarians: an innovative approach to library service: a case study on technical university libraries in India. *International Journal of Digital Library Services,* 6(1), 104-112.

Yakubu, A. S., Yagana, A. A. & Umar, S. Y. (2023). Investigating Librarians' Intention to Use Artificial Intelligence for Effective Library Service Delivery: A Partial Least Square-Structural Equation Modeling-Based Approach. *Dutse Journal of Pure and Applied Sciences (DUJOPAS)*, 9(1b), 1-14. https://dx.doi.org/10.4314/dujopas.v9i1b.1

Yusuf, T. I., Adebayo, O. A., Bello, L. A. & Kayode, J. O. (2022). Adoption of Artificial Intelligence for Effective Library Service Delivery in Academic. *Libraries in Nigeria. Library Philosophy and Practice (e-journal)*. 6804. https://digitalcommons.unl.edu/libphilprac/6804