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## **Application of emerging technologies for research support in Nigerian academic libraries: Trends, problems and prospects**

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### **Abstract**

Academic libraries in the modern era are often asked to justify their existence in tertiary institutions by showing how the institution and society at large have benefited from the library services. One main area that librarians often point to is the research productivity of members of academic institutions. However, studies have shown that research productivity among Nigerian scholars is low, which means that academic libraries have to be more innovative in supporting researchers in their domains. Emerging technologies offer innovative ways of supporting research activities by providing tools and resources that streamline the research process and ensure proper visibility for research outputs of academic library clients. This article, which is based on a review of previous studies, explores various areas where academic libraries in Nigeria can apply emerging technologies, the likely challenges, and strategies that can be adopted to ensure sustainable use of emerging technologies in academic libraries. It has been found that emerging technologies can enhance existing library services and create new ones, such as data mining, data management, and scholarly communication, among others. However, although steps are being taken by academic librarians in Nigerian tertiary institutions to leverage technology in providing the needed support for researchers, the pace of technology adoption is still slow and the range of technologies being adopted is limited compared to available options. This state of affairs has been attributed to challenges such as lack of infrastructure, librarians' skills, and a negative attitude towards change. The study recommends a multidimensional approach to the application of emerging technologies in Nigerian academic libraries

### **Keywords**

artificial intelligence, emerging technologies, library automation, library services, research support.

### **Introduction**

The use of emerging technologies in academic libraries has become widely accepted, especially in the provision of various research support services. The modern academic library is no longer expected to play the role of information custodian but rather operate as facilitators in the creation, dissemination and use of knowledge. Academic librarians are laying more emphasis on research-centered services such as information organization and retrieval, citation management, data management, electronic publication, and other services capable of enhancing the quality of research output in academic institutions (Sewell & Kingsley, 2017; Moruf & Dangani, 2020). The ability of academic libraries to achieve their aim of assisting researchers to effectively use available information resources for the

creation of new knowledge now rests on how well librarians are familiar with and able to utilize emerging technologies to support all aspects of research.

The emergence of information technology and the remote access to information resources and other research tools have led to questions about the relevance of library services in the research process (Momoh & Folorunso, 2019; Arumuru, 2020). Available information, however, indicates that, despite the touted 'unlimited' access to information resources and research tools, the research output of researchers in developing countries such as Nigeria is still below expectations (Okagbue et al., 2018; Orji & Anunobi, 2019; Oluwasanu et al., 2019). With the importance of research to national development, this indicates a gap that academic librarians can fill by providing the right library and information services capable of not only enhancing the research productivity of researchers in Nigeria but also contributing to the visibility and impact of the research output emanating from Nigerian tertiary institutions.

However, although steps are being taken by academic librarians in Nigerian tertiary institutions to leverage technology in providing the needed support for researchers in their domains, the pace of technology adoption is still slow and the range of technologies being adopted is limited compared to available options (Bakare, 2023). According to Moruf and Dangani (2020), academic library users are demanding broader range of services delivered in accurate and efficient manner. So it is important for librarians to do all they can to meet these expectations. The purpose of this article is therefore to highlight various emerging technologies available to academic librarians for research support, areas in which academic librarians can apply emerging technology to support researchers, the issues surrounding the use of emerging technology in academic libraries, and the strategies that can be applied to overcome the challenges.

### **Emerging technologies in academic libraries**

The concept of emerging technology would seem straightforward to describe based on its name as a new technology that is just coming to people's attention based on its uniqueness or usefulness. However, Rotolo, Hicks, and Martin (2015) are of the opinion that the definition of what constitutes an emerging technology depends on the perspective of each scholar. This is reflected in the submission of Saibakumo (2021), who posited that emerging technologies in the context of library and information science are those technologies that are recently being introduced into the librarianship profession based on the recognition that they can help improve service provision. From this perspective, emerging technology in the context of libraries and information science can be described as technological innovations that have recently been discovered to be relevant to service provision in libraries. There are many examples of these technologies that can be used to support the activities of researchers in order to boost research productivity.

Emerging technologies relevant to research support, according to Moruf and Dangani (2020), include bibliographic citation management software such as Mendeley, etc; instructional system design software such as Blackboard, Edmodo, etc.; electronic copyright management systems; classroom management software such as Moodle, Google Classroom, Canva, etc.; library automation software such as Koha, Greenstone, D-Space; electronic resource management software; and integrated search software, among others. Saibakumo (2021) also identified emerging technologies that include QR (quick response) barcode technology, cloud computing, robotics, and artificial intelligence (AI). In

addition, Odeyemi (2019) identified ambient intelligence and data mining as new emerging technologies that have been introduced into libraries to improve the efficiency of librarians and satisfy the needs of users by bridging the information gap. These studies have shown that there are numerous emerging technologies relevant to the needs of librarians, especially in supporting researchers. As pointed out by Moruf and Dangani (2020), technologies are emerging at a rapid pace and potentials adopters such as librarian can decide on which ones to adopt. It is therefore important to match the available technologies with the relevant services that libraries can provide to researchers in the 21st century.

### **Application of emerging technology in research support**

As emerging technologies have been found to enhance research and information management, academic libraries have the option to adopt these technologies to enhance their service delivery, especially in the area of research support. Some of these services include information resource management, research data management, copyright advisory, citation management, scholarly communication, data analysis services, research preservation and curation, and digital literacy training, to name but a few (Das & Banerjee, 2021; Keller, 2015; Sewell & Kingsley, 2017).

#### **Information resource management**

The main role of academic libraries is to provide the necessary information resources needed by researchers. With the aid of emerging technologies, libraries can move from being information custodians concerned with storing information to information access providers. This is done through the use of integrated library management systems. An integrated library management system (ILMS), according to Sheik and Olugbenga (2019), is a complex program or database that can be used to automate regular library routines such as cataloging and classification, charging and discharging, and remote access to information. A typical ILMS has an OPAC (Online Public Access Catalogue), which acts as a search engine for library users to find the available information.

Although the ILMS has been in existence for a while, the application of emerging technologies, particularly artificial intelligence, can now be used to turn the OPAC into an expert system (Asemi & Asemi, 2018). As a result of the integration of AI, modern-day OPAC has transformed into a real information system that can provide electronic information resources, track user preferences, and make necessary recommendations. The most important factor is that it makes the carefully selected information resources by librarians available to the researchers round the clock and online.

Data Mining (Bibliometric): The amount of existing literature has grown to the extent that no individual can be able to synthesize and engage with it. Thus, researchers try to find ways in which emerging technologies can speed scientific discovery by incorporating artificial intelligence into research workflows, such as the use of emerging technology to automate the information search. Data mining tools are one of the most useful emerging technologies that can be used by information professionals to bring order into the chaotic world of information. The use of tools such as Rapid Miner, Orange, Weka, etc. (EDUCBA, 2021) offers various advantages to librarians. According to Lone and Khan (2014), data mining allows libraries to effectively support researchers by providing insight into the composition of database collections. With data mining, librarians can easily identify emerging trends in research and use the information to provide current awareness services and selective dissemination of information to researchers, thereby saving them a lot of preliminary work in their research.

**Digital Reference Services:** Online information resources have become the first choice of researchers when seeking information resources for their research. However, they often face challenges in using these resources (Hagiwara et al., 2022; Akande & Popoola, 2022). Librarians have found that with technology, they can extend the reference services that they traditionally render within the library to the digital space. Many libraries are now taking advantage of AI-enabled chatbots to render round-the-clock digital reference services even when librarians are not available (Wan, 2022; Panda & Chakravarty, 2022). The use of chatbots offers researchers the opportunity to get help with using electronic information resources whenever they need help. This can enhance productivity by ensuring that minor issues hindering effective use of information systems are solved as they arise.

**Research Data Management:** One of the practices that has been known to enhance research reproducibility is research data management. Emerging tools in research data management include the Open Science Framework, DMP Tool, ResearchWorks Archive, RedCap, perma.cc, ORCID, and several others (Library Guides, 2022). In the digital world, research data, both qualitative and quantitative, has become an essential commodity among researchers. Calvert and Kennedy (2020) reported that the collection, exchange, and preservation of data have become common practices among researchers. This has made libraries in the developed world take advantage of emerging technologies for data management and dissemination. Some libraries have created data repositories, while others are partnering with large data repositories such as Zenodo and Dryad. The idea is to free researchers from data management tasks so that they can focus more on research.

Calvert and Kennedy (2020) found that librarians, particularly in the United States, are making advances in research data management by leveraging emerging technologies. The application of emerging technology in data management offers several advantages, which include a reduction in the cost of data curation, providing opportunities for researchers to discover and access research data from local and global sources, and adding value to data through expert processing and organization, which means that researchers are provided with a body of related data relevant to a given study. The net effect of reducing the task of researchers to allow them to dedicate more time to research.

### **Issues in the use of emerging technologies for research support in Nigeria**

The benefits accrued from the application of emerging technology notwithstanding, available evidence from Nigeria shows that only a few academic libraries have made appreciable attempts at incorporating them in library and information services provision. For one, most librarians in Nigeria are not clear about what constitutes emerging technology and consequently, their specific application to research. Agbetuyi and Isah (2021) grouped emerging technologies into OPAC, mobile-based technology, Web 2.0 technology, institutional repositories, and cloud computing technology. But the authors did not go into specifics. The study by Adeoye, Oladokun, and Opalere (2021) was more specific as it examined the readiness for digital reference services among librarians. It was found that the majority of the librarians were ready but there are institutional issues affecting digital reference services in Nigerian libraries.

In the same vein, Rotimi, et al., (2022) found that Nigerian libraries are yet to exploit the abundant opportunities offered by emerging technology rendering innovative library services. The study found that library services in Nigerian academic libraries are still dominated by manual operations with limited application of basic technologies. Also, examining the readiness of Nigerian academic librarians to adopt robotic technologies in rendering library services Owolabi et al. (2022) reported that, neither the libraries nor the academic librarians show adequate level of readiness to incorporate the emerging

technology in their services. The same could be said of other emerging technologies that could be adopted to support research activities in tertiary institutions. There are various reasons for this state of affairs .

Abayomi et al., (2021) examined the level of awareness and perception of academic librarians regarding the adoption of artificial intelligence (AI) in library operations. The finding showed that the librarians were quite aware of the benefits of AI tools but they did not support its adoption for fear of being made redundant and losing their jobs. In Addition, Misau (2021) reported that while emerging technologies such as Expert Systems in Reference Services, Technical, Indexing, Acquisition, Pattern Recognition and Robotics are relevant to academic library operation, there is a need for academic librarians to be properly trained and sensitized on the use of these technologies. However, the factors affecting the adoption and use of emerging technologies for research support are not limited to librarians' skills or attitude. According to Bawack and Nkolo (2018), adoption of emerging technologies has not taken root in developing countries due to institutional factors such as lack of a clear cut policy, infrastructural deficit, and the dearth of innovative library managers.

The implication of all this is that a multidimensional approach is required to stimulate the widespread adoption of emerging technologies to facilitate effective research support in Nigerian academic libraries. The strategy to be adopted to ensure the adoption of emerging technologies must take cognizance of the various interwoven issues affecting the adoption of emerging technologies.

### **Strategies to boost the application of emerging technologies for research support in academic libraries.**

As an innovation that has come to change the existing status quo, the successful adoption and application of emerging technologies in research support, even in developed countries, requires a holistic approach that must be driven by library management. According to Calvert and Kennedy (2020), academic library managers must secure the support of key decision-makers in their institutions in order to create an official policy that mandates and supports the use of technology. This is important because of all the infrastructure and logistics required for the effective use of technologies.

Academic librarians are experienced in traditional research and information services, which offers them leverage in the use of technologies for research support. However, effective use of emerging technologies to support researchers and conduct their own research requires some upskilling. It is important that academic librarians are well versed in the technologies they are introducing to their clients. In addition, it is important that academic librarians always stay a pace or two ahead of their clients in terms of their skills and knowledge about emerging technology. The level of skill acquisition required must, however, be coordinated to ensure that the skills acquired match the overall aims of the library and the institution it serves. In essence, academic libraries must take charge of the skill development of their personnel instead of leaving every librarian to fend for themselves.

### **Conclusion.**

The current level of research productivity in Nigerian tertiary institutions shows that there is a big role for the academic library to play in boosting research productivity. Providing support for researchers in the 21st century has, however, evolved beyond merely stocking a large collection; the main trend today is the provision of access to information tailored as close to the needs of the researcher as

possible. To meet this need, it requires the application of emerging technologies. These are new digital innovations used to create, synthesize, organize, and make information available for easy access. This study has, however, shown that despite the availability of various technologies, most of which are freely available online, the application of emerging technologies is progressing at a slower pace which suggests a need for strategic intervention from all stakeholders. It is expected that the various recommendations made in this study and other relevant studies would lead to an increased pace of technology adoption in Nigerian academic libraries..

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