WEB TECHNOLOGIES DEPLOYMENT FOR EFFECTIVE LIBRARY SERVICE DELIVERY: EVIDENCE FROM CHUKWUEMEKA ODUMEGWU OJUKWU UNIVERSITY LIBRARY, IGBARIAM, ANAMBRA STATE, NIGERIA

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Abstract

This study investigated the adoption and use of web technologies in library service delivery at Chukwuemeka Odumegwu Ojukwu University Library, Igbariam. Two research objectives guided the investigation, focusing on the adoption and utilization of web technologies for library service delivery. The study adopted a quantitative approach using a descriptive survey research design. A census sampling technique was employed to include all 23 librarians in the library under study. Data were collected using a structured questionnaire and an observational checklist, while descriptive statistics including frequencies, percentages and mean scores, were used for data analysis. The findings revealed that core web technologies, such as electronic databases, social media platforms, and institutional repositories, are widely adopted and effectively utilized in service delivery. However, advanced technologies, including Web 2.0 applications, cloud computing, mobile applications, and the Online Public Access Catalogue (OPAC), have not been adequately adopted or utilized. The study concluded that the library has made appreciable progress in integrating essential Web technologies into its services, greater efforts are required to embrace emerging digital technologies. It therefore recommended increased investment in web technologies, continuous professional development, and regular capacity-building programmes for librarians to strengthen technology-driven service delivery and accelerate digital transformation in academic libraries. The findings contribute to the growing body of knowledge on the role of web technologies in enhancing library service delivery in Nigerian university libraries.

Keywords: Web technologies, Academic Libraries, Library service delivery, Digital transformation, Librarians

Introduction

The academic library serves as a fundamental cornerstone for any university's success. It functions as a credible resource center for students, researchers, and staff to utilize scholarly resources to enhance education and research. It generally aligns with the objectives of its parent institution, which entails guaranteeing that it attains its goals. The library must offer cutting-edge, effective services that satisfy patrons' requirements and expectations in order to successfully carry out this job. The efficiency of these services is frequently assessed by the quality and quantity of informational resources and the standard of service rendered. Today, the library is a bustling information center where resources are available in various formats to benefit users. Traditionally, the library was seen as a physical repository of books and other printed materials. However, with the proliferation of digital technologies, the library has evolved to become a hybrid institution, offering both physical and digital resources. The Internet and web technologies have revolutionized the way the library operates, providing new opportunities for information dissemination, access, and management. This digital shift has dramatically influenced how academic libraries support their institutions' teaching, learning, and research mandates.

In a library setting, web technologies encompass various tools, software, and platforms that support the management, discovery, and delivery of library resources and services. Web technology develops from mechanisms that allow two or more computer devices to communicate over a network. Building on this, Tshikotshi (2019) emphasized that web technologies enable individuals to communicate and share information on the Internet, and as a result, academic libraries must diversify their resources to sustain the new information service trends emerging from the utilization of these technologies.

Furthermore, these technologies improve the library's online presence, support access to information, and promote learning and research, as noted by Bhosale (2023). He explained that web technologies have revolutionized library activities such as document acquisition, technical processing, circulation, reference services, resource sharing, and document distribution. This shift has led to enhanced operational efficiency, increased work output, and reduced costs while simultaneously boosting user engagement. Web technologies have also ushered in new dimensions to information dissemination, transforming the way information systems and services operate. They have introduced substantial changes in libraries, enabling the provision of a wide range of services in virtual spaces. According to Tshikotshi (2019) web technology applications encourage library users to be part of online communities, contributing and interacting with the digital resources available to them. Towolawi (2018) reinforced this, highlighting how web technologies have profoundly reshaped academic libraries, influencing how services are delivered and accessed.

Libraries have progressively adopted tools such as blogs, instant messaging, multimedia sharing tools, podcasts, Really Simple Syndication (RSS) feeds, social networking sites, and wikis to promote their services, foster collaboration, provide online reference support, and manage digital collections, as documented by (Thomas, 2017). This integration has enabled libraries to extend their services beyond physical confines, granting users seamless access to information resources regardless of their location or time of need.

Among the primary web technologies employed in academic libraries are databases, institutional repositories, Online Public Access Catalogues (OPACs), and social media

platforms. Each of these technologies contributes significantly to the effectiveness and timeliness of library services by providing broad access to diverse information resources.

While libraries globally continue to evolve through web technologies, based on the knowledge of the researcher, there is a scarcity of empirical research on their application and effects within Nigerian university libraries. Specifically, little attention has been given to evaluating how these technologies influence service delivery at Chukwuemeka Odumegwu Ojukwu University Library, Igbariam. Hence, the need for this study.

Statement of the Problem

Web technologies are designed to enhance efficiency in library services by improving access to information, streamlining operations, and supporting real-time user engagement. Ideally, these technologies facilitate seamless access to institutional repositories, digital catalogs, electronic databases, and online reference services, transforming libraries into dynamic knowledge centers that support teaching, learning, and research through personalized, efficient, and remotely accessible services.

However, it seems that in many Nigerian academic libraries, the adoption and effective application of web technologies remain limited. Through preliminary observation, the researcher discovered a lot of hitches to information access at the University Library under study, which makes the researcher wonder if web technologies are actually in use in their library. The concern of this study was to determine the adoption and use of web technologies on the services rendered by librarians at Chukwuemeka Odumegwu Ojukwu University, Igbariam.

Objectives of the Study

The specific objectives are:

1. To investigate the web technologies currently adopted by librarians at Chukwuemeka Odumegwu Ojukwu University Library, Igbariam, Anambra State.

2. To determine the usage of these technologies for effective library services delivery by librarians at Chukwuemeka Odumegwu Ojukwu University Library, Igbariam, Anambra State.

Literature Review

Web Technologies Currently Adopted by Librarians

The adoption of web technologies in libraries has transformed how information is accessed, managed, and disseminated. According to Mustapha, Muhammed and Ahmad (2023) Online Public Access Catalogue (OPAC) remains one of the most prominent tools adopted by libraries to enable users to search and locate resources. Their study revealed that while most students are aware of OPAC systems, actual usage remains moderate due to difficulties in navigating the interface and limited digital literacy among users. Similarly, Isah, Salma, and Salami (2021) noted that OPAC plays a vital role in reducing the time required to locate books and other materials, though many students still depend heavily on library staff for assistance.

Alabi (2021) further stressed the importance of upgrading OPAC interfaces with smart search algorithms, recommender systems, and user training to improve efficiency. Institutional repositories have also become a central web technology for academic libraries. Hurum, Mahawar, and Shimray (2024) observed that these repositories serve as digital archives for

scholarly works such as theses, dissertations, and journal articles. Their findings revealed that while users appreciated the accessibility and open access nature of repositories, challenges of metadata quality and system performance affected discoverability. In a similar study, Lawal and Ani (2018) reported that the adoption of platforms like DSpace and EPrints has allowed universities to enhance the visibility of their research outputs, increase citation impact, and support institutional branding.

Ezeabasili and Idhalama (2025) also reported that, libraries in Nigeria have integrated only the basics of the innovative technologies such as AI technologies, D-space, Social media and internet of things in their service delivery, according to the authors, even the few innovative technologies integrated has been found to improve a lot of services at the library which shows that they are very effective in their services delivery. Electronic databases is another important category of web technologies used in academic libraries.

Adedokun and Fawole (2018) found that students heavily utilized email and e-news services but underutilized major electronic databases such as JSTOR, ProQuest, and ScienceDirect due to low awareness and high subscription costs. Muhammed, Ahmadu, Adamu, and Umar (2022) also reported that in Nigerian university libraries, the usage of subscribed databases remained low due to inadequate digital literacy training, poor internet access, and limited funding for subscriptions. To address these barriers, many institutions have adopted federated search engines and discovery tools such as EBSCO Discovery Service and Ex Libris Primo, which allow simultaneous searches across multiple databases (Patel, 2020).

The use of social media platforms and Web 2.0 tools has also become common in library practice. Bamigboye, Ekeh, and Agboola (2019) observed that Nigerian university librarians make extensive use of Facebook, WhatsApp, Twitter, and YouTube for promoting services, offering user education, and engaging with students in real-time. Their findings further revealed that blogs, wikis, and podcasts were employed to enhance user collaboration and support virtual reference services. Islam, Sultana, and Mostofa (2024) highlighted that social media platforms help in disseminating announcements, library news, and instructional materials, though some librarians expressed concerns about professionalism and the lack of institutional policies to guide usage.

Cloud-based library management systems have also been adopted by many libraries as part of their technological shift. Dime and Chukwuma (2023) documented the adoption of cloud-hosted Integrated Library Systems (ILS) such as Koha, Evergreen, and Alma, which offer modules for cataloging, circulation, acquisitions, and serial management. Their study revealed that cloud adoption improved accessibility and reduced infrastructure costs for libraries. However, challenges such as vendor lock-in, internet dependency, and privacy concerns were also identified.

Mobile technologies are another web-based tool employed in modern academic libraries. Vivek (2024) found that many libraries now provide mobile-friendly websites, SMS alert services, and mobile apps that allow students to receive due-date reminders, search catalogs, and access resources on the go. Their findings also emphasized that mobile platforms improved inclusivity by serving distance learners and those with limited access to desktop computers.

Learning Management System (LMS) integration has also been recognized as a significant web technology used by librarians. Apoki (2021) demonstrated how semantic web

tools integrated with platforms like Moodle and Blackboard allowed libraries to embed digital resources directly into course content. This integration not only improved search accuracy but also personalized access to course-specific materials. Similarly, Raza (2019) explained that semantic web technologies such as RDF and SPARQL supported more intelligent search and retrieval within library systems. Recent studies have also documented the gradual introduction of artificial intelligence (AI) tools in library services. According to Patel (2020) some academic libraries have experimented with AI-powered chatbots that provide real-time assistance to users, answer frequently asked questions, and guide students through catalog searches. Though still in its early stages, this innovation represents a growing trend toward intelligent and automated library support systems. The web technologies currently employed by librarians include OPAC, institutional repositories, electronic databases, social media platforms, cloud-based library management systems, mobile technologies, LMS integration, and emerging AI applications. These tools, as highlighted by various authors, have enabled librarians to expand access, improve efficiency, and enhance user engagement, though challenges such as usability, cost, digital literacy, and infrastructure limitations continue to affect their adoption.

Despite the progress made, Thomas (2017) observed that the adoption of web technologies varies between developed and developing regions. His research showed that while libraries in technologically advanced countries have adopted cloud systems, mobile applications, and discovery tools, those in developing nations still struggle with poor funding, inadequate ICT infrastructure, and low levels of digital literacy among staff. This gap, according to him, reflects the uneven pace of digital transformation in library services worldwide.

Usage of Web Technologies in Library Service Delivery

The adoption of web technologies in library service delivery has significantly transformed how librarians interact with users, manage resources, and fulfill institutional mandates. In the past, library services were predominantly dependent on physical resources and face-to-face interactions. However, with the advancement of web-based systems, libraries have shifted into hybrid and fully digital models that facilitate remote access, real-time communication, and interactive services. This transition has been documented in scholarly works that highlight the multifaceted roles web technologies play in reshaping service delivery within academic libraries.

According to Tshikotshi (2019) virtual reference services are among the most visible uses of web technologies in academic libraries. These services provide platforms through which users can interact with librarians synchronously or asynchronously using tools such as email, chat platforms, video conferencing, and social media applications like WhatsApp and Facebook Messenger. Such platforms remove geographical barriers and enable users to receive assistance outside traditional library hours. Similarly, platforms such as LibChat and Google Meet have been deployed to support real-time consultations, digital reference, and research support, ensuring that users can access professional help remotely.

The Online Public Access Catalogue (OPAC) is another essential web-based service used extensively in library operations. Dime and Chukwuma (2023) noted that OPAC provides users with access to bibliographic records, availability status, and advanced search functions. With enhancements such as personalized dashboards, recommender systems, and linked data integration, OPAC now serves as more than a retrieval system; it is an interactive platform that facilitates user-centered access to library resources. Alabi (2021) further emphasized that OPAC systems integrated with mobile applications have increased accessibility and improved

user satisfaction, particularly in academic settings where students require quick and seamless access to resources.

Electronic resources delivery has also been identified as a critical aspect of service delivery through web technologies. Adedokun and Fawole (2018) observed that academic libraries provide users with access to e-books, e-journals, databases, and multimedia learning content through digital portals. These platforms enable access to scholarly content beyond physical spaces and support 24/7 learning. However, the authors found that limited awareness and high subscription costs often hinder optimal utilization of these resources. In response, libraries have adopted federated search tools such as EBSCO Discovery Service and Primo, which simplify access by allowing users to search multiple databases simultaneously (Muhammad et al. 2022).

Social media platforms also play a growing role in service delivery. Bamigboye, Ekeh, and Agboola (2019) reported that Nigerian university libraries increasingly use Facebook, Twitter, WhatsApp, and YouTube for user engagement, service promotion, and academic collaboration. These tools allow librarians to share announcements, organize virtual literacy workshops, and gather user feedback. Islam, Sultana, and Mostofa (2024) added that such platforms foster real-time interaction and enable libraries to maintain visibility in the digital space. Despite this, Akwang (2021) argued that institutional policies and lack of training often limit the effective adoption of social media platforms by librarians.

Another significant dimension is the role of cloud computing in library service delivery. Dime and Chukwuma (2023) explained that cloud-hosted Integrated Library Systems (ILS) such as Koha and Evergreen provide modules for cataloging, circulation, acquisitions, and serial management. These services reduce infrastructure costs, allow remote access, and support real-time updates. Cloud computing has further enabled innovations such as virtual reference desks, digital lending services, and interlibrary collaboration. Nonetheless, concerns regarding internet dependency and data privacy remain critical issues in their deployment. Mobile technologies complement these innovations by expanding access for users who rely on smartphones rather than desktop computers. Vivek (2024) stressed that mobile-optimized websites, QR codes, and SMS alert systems have significantly improved accessibility, particularly for distance learners and students in underserved areas. Similarly, mobile apps enable features such as catalog searches, overdue reminders, and personalized updates, enhancing the inclusivity of library services.

Libraries have also used web technologies to support digital literacy and user education. Thomas (2017) observed that online tutorials, webinars, and research guides are increasingly delivered through library websites and platforms such as YouTube and Moodle. These digital instructional tools help students learn how to navigate databases, evaluate information, and use citation software. Such initiatives reduce the need for face-to-face sessions and enable continuous learning. Furthermore, web analytics and artificial intelligence have been adopted to personalize services and improve efficiency. Patel (2020) pointed out that usage statistics from tools like Google Analytics or library-specific dashboards allow librarians to make evidence-based decisions about resource allocation and service design. Apoki (2021) demonstrated that semantic web technologies integrated into learning management systems create personalized user experiences by recommending resources and tailoring content to individual needs.

In addition, institutional repositories supported by platforms like DSpace and EPrints have become vital in providing open access to scholarly outputs. Hurum, Mahawar, and Shimray (2024) highlighted that repositories improve research visibility, promote knowledge sharing, and support academic credibility, though issues of usability and discoverability remain. Collectively, these findings indicate that the usage of web technologies in library service delivery has evolved into a multi-dimensional framework. From OPAC and institutional repositories to social media, mobile tools, and cloud systems, each technology addresses specific user needs while simultaneously expanding the scope of library services. However, successful implementation depends on user awareness, librarian competence, funding, and institutional support.

Research Methodology

The study adopted a quantitative approach using a descriptive survey research design. This design was deemed suitable as it facilitates the methodical gathering of data from a chosen group to elucidate current conditions, practices, and perceptions technologies used in library services. The study was conducted at Chukwuemeka Odumegwu Ojukwu University (COOU), Igbariam campus library, located in Anambra State, Nigeria. The population comprised of 23 librarians in Chukwuemeka Odumegwu Ojukwu University Library, Igbariam. An observation checklist and a questionnaire were the instruments used for data collection. The checklist was used to ascertain the web technologies adopted by librarians at COOU library for effective library service delivery. Copies of the questionnaire were personally distributed to the staff by one of the researchers and collected back after completion. Data collected were analyzed using simple percentages and arithmetic mean. Decision Rule**:** Items with mean rating/percentages of 2.50/50% and above were regarded as agreed/adopted while items with mean ratings/percentages below 2.50/50% were regarded as disagreed/not adopted.

Result

Research Question 1: What are the web technologies currently adopted by librarians in Chukwuemeka Odumegwu Ojukwu University Library, Igbariam?

Table 1: Web technologies currently adopted by librarians in Chukwuemeka Odumegwu Ojukwu University Library, Igbariam (N = 23 librarians)

S/NO	Item	Adopted (n)	Adopted (%)	Not Adopted (n)	Not Adopted (%)	Status
1	Online Public Access Catalogue	0	0.0	23	100.0	Not Adopted
2	Databases	23	100.0	0	0.0	Adopted
3	Social Media Platforms	23	100.0	0	0.0	Adopted
4	Institutional Repository	23	100.0	0	0.0	Adopted
5	Web 2.0 Application	0	0.0	23	100.0	Not Adopted
6	Cloud Computing Technologies	0	0.0	23	100.0	Not Adopted
7	Mobile App	0	0.0	23	100.0	Not Adopted

Source: Researcher's Computation (2026)

The table reveals that Chukwuemeka Odumegwu Ojukwu University Library, Igbariam adopted only three out of the seven major web technologies for library service delivery, which include Databases, Social Media Platforms, and Institutional Repositories. Conversely, technologies such as Online Public Access Catalogue, Web 2.0 Applications, Cloud Computing Technologies, and Mobile Apps are not currently adopted, indicating areas needing further investment and strategic development. This gap underscores the need for targeted funding, policy formulation, and capacity building to expand the library's digital infrastructure and enhance service delivery.

Research Question 2: How often are these web technologies used on library service delivery at Chukwuemeka Odumegwu Ojukwu University Library, Igbariam?

Table 2: Usage of these web technologies on library service delivery at Chukwuemeka Odumegwu Ojukwu University Library (N = 23 librarians)

S/NO	Item	Mean	Decision
1	Online Public Access Catalogue	1.57	Never
2	Database	3.26	Very Often
3	Social Media Platforms	2.52	Often
4	Institutional Repository	2.13	Occasionally
5	Web 2.0 Application	1.00	Never
6	Cloud Computing Technologies	1.00	Never
7	Mobile App	1.00	Never
	Total Mean	1.70	Never

Source: Researcher's Computation (2026)

The data in Table 2 shows that out of the seven major web technologies listed, only three are currently in use at Chukwuemeka Odumegwu Ojukwu University Library, Igbariam. These are Database (3.26), Social Media Platforms (2.52), and Institutional Repositories (2.13), this suggests that Databases are used very often, Social Media Platforms are used often, and Institutional Repositories are used occasionally, reflecting varying degrees of operational reliance on these tools within the library. In contrast the four "Never" used items includes Online Public Access Catalogue, Web 2.0 Application, Cloud Computing Technologies and Mobile Apps with the mean score ranging from (1.00 to 1.57) signifying complete non-engagement by librarians and an absence of these tools in the library's current digital practices.

Discussion of Findings

Only few web technologies were adopted at Chukwuemeka Odumegwu Ojukwu University Library, Igbariam and they are Databases, Social Media platforms and institutional repositories. Others such as the Online Public Access Catalogue (OPAC), Web 2.0 applications, cloud computing technologies, and mobile apps were not adopted at all. This pattern of selective adoption is consistent with Mustapha, Muhammed, and Ahmad (2023) who found that OPAC systems, though available, remain unadopted in many Nigerian libraries due

to low usability and insufficient training. Ezeabasili and Idhalama (2025) reported that, libraries in Nigeria have integrated only the basics of the innovative technologies such as AI technologies, D-space, Social media and internet of things in their service delivery. Bamigboye, Ekeh, and Agboola (2019) also observed that social media tools like WhatsApp and Facebook are commonly used in Nigerian academic libraries to promote services and interact with users. Together, these studies affirm the trend revealed in this research: adoption focuses on core technologies, while OPAC and advanced applications are yet to be adopted.

Most of the web technologies were never in use, only the three adopted technologies databases, social media platforms, and institutional repositories were used at varying frequencies, ranging from very often to occasionally. This aligns with Adedokun and Fawole (2018) who noted that even when electronic databases are provided in Nigerian universities, their frequency of use varies because of subscription costs and limited awareness. Tshikotshi (2019) similarly observed that the extent of ICT usage in libraries depends on factors such as infrastructure reliability and staff competence. Islam, Sultana, and Mostofa (2024) added that while social media platforms are increasingly introduced into library services, their application is still uneven and lacks structured integration. These studies confirm the evidence from this study that frequency of usage is concentrated in a few technologies while most remain unused.

Conclusion

This study concluded that librarians at Chukwuemeka Odumegwu Ojukwu University Library, Igbariam, have selectively adopted web technologies. Out of the seven technologies examined, only databases, social media platforms, and institutional repositories are widely adopted and effectively utilized in service delivery, while OPAC, Web 2.0 applications, cloud computing technologies, and mobile apps are yet to be adopted. The adopted tools are applied at varying frequencies. However, the lack of adoption of advanced technologies implies that librarians may not be fully equipped to deliver user-centered, innovative services.

Recommendations

Based on the findings of this study, the following recommendations are made to enhance the adoption and effective utilization of major web technologies at Chukwuemeka Odumegwu Ojukwu University Library, Igbariam:

1. **Training and Capacity Building of Librarians**: Since limited digital literacy among librarians hinders adoption, regular training and professional development programs should be organized. These programs should focus on practical skills in using web technologies such as OPAC, Web 2.0 tools, cloud computing, and mobile applications.

2. **Adequate Funding for Web Technologies**: Adequate financial resources should be allocated to the library. This funding should cover the acquisition, maintenance, and continuous upgrading of web technologies, as well as staff training.

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