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Adoption and implementation of open source library management systems in federal ministry libraries in Abuja, Nigeria

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Abstract
The study investigated the adoption and implementation of open source Library management systems for effective information retrieval in federal ministry libraries in Abuja, Nigeria. The descriptive research design was employed for this study. Two research questions were answered and one hypothesis was tested in the study. The population of the study consisted of 135 librarians and system analysts in the 46 federal ministries in Federal Capital Territory, Abuja, Nigeria and the census sampling technique was used to study the entire population. The questionnaire was the instrument used for data collection. The data were analyzed with descriptive and inferential statistics. The reliability estimate was computed using Cronbach's alpha reliability coefficient and yielded coefficient index of 0.87. The findings revealed that Koha is the most prevalent open source library management system implemented for effective information retrieval in federal ministry libraries in Abuja, while the overall implementation of open source library management systems remain at the planning stage. The study concluded that the adoption and implementation of open source library management systems in federal ministry libraries in Abuja, Nigeria remain low The study recommended increased adoption of open source library management systems, particularly Koha, through adequate government funding, improved ICT infrastructure, and continuous training of librarians to enhance effective information retrieval and library service delivery in federal ministry libraries in Abuja, Nigeria.

Keywords: Adoption, implementation, open source library management systems, federal ministry libraries in Abuja, Nigeria.

Introduction
The rapid advancement of information and communication technologies (ICTs) has transformed the management of library resources and services across the world. Libraries are increasingly adopting automated systems to improve operational efficiency, facilitate access to information resources, and respond to the evolving information needs of users (Aregbesola et al., 2019). Library automation has therefore become an indispensable component of modern librarianship, enabling libraries to deliver timely, accurate, and user centered information services. Among the available automation solutions, open source library management systems have attracted considerable attention because they provide flexible, cost effective, and customizable alternatives to proprietary software (Muller, 2011). Unlike commercial library software that requires licensing fees, open source systems allow institutions to access, modify, and redistribute the source code according to their operational requirements. This flexibility has made open source solutions particularly attractive to libraries in developing countries where financial resources are often limited (Breeding, 2018).

An open source library management system is an integrated software application designed to automate major library operations, including acquisition, cataloguing, classification, circulation, serials management, online public access catalogue (OPAC), and user management (Pratheepan, 2019). According to Aregbesola et al. (2019), integrated library management systems support the creation, organization, storage, preservation, and dissemination of library resources through a unified platform. Similarly, Uzomba et al. (2015) noted that

integrated library software automates routine library activities and improves the efficiency of information management. Widely used open source platforms include Koha, Evergreen, NewGenLib, Greenstone, and OpenBiblio, all of which have been implemented in different libraries to support efficient library operations.

The increasing adoption of open source library management systems is largely attributed to their affordability, interoperability, scalability, and active developer communities that continuously improve system functionality (Breeding, 2018). These systems enhance bibliographic control, facilitate online access to library collections, improve resource sharing, and strengthen information organization and retrieval. Consequently, many libraries have embraced open source software as a strategic approach to improving service delivery while minimizing operational costs.

Successful implementation of an open source library management system, however, extends beyond software acquisition and installation. It involves systematic planning, infrastructure development, software customization, database creation, data migration, staff training, system testing, deployment, and continuous maintenance (Smith, 2017). The implementation process depends on the availability of adequate financial resources, ICT infrastructure, reliable internet connectivity, technical support, and skilled library personnel capable of managing automated library systems. Where these requirements are inadequate, implementation efforts often experience delays, underutilization, or eventual abandonment.

Federal ministry libraries are specialized libraries established to provide information resources and services that support government administration, policy formulation, research, and organizational productivity (Viriri, 2019). These libraries serve employees of various ministries by organizing and disseminating specialized information required for administrative and professional activities. According to Adebayo et al. (2018), ministry libraries also contribute to institutional knowledge management by preserving official publications, supporting research activities, and facilitating access to relevant information resources. Consequently, the adoption and implementation of open source library management systems have become increasingly important for improving the quality and efficiency of services provided by these libraries.

Despite increasing awareness of the benefits associated with library automation, the level of adoption and implementation of open source library management systems among federal ministry libraries in Nigeria appears to vary considerably. While some ministry libraries have implemented systems such as Koha and other open source platforms, others continue to rely on manual operations or have only partially implemented automation projects (Adegbule-Adesida, 2015; Uzomba et al., 2015). Factors such as inadequate funding, insufficient technological infrastructure, limited technical expertise, inadequate staff training, and weak institutional support continue to affect successful implementation.

Understanding the extent of adoption and implementation of open source library management systems in federal ministry libraries is essential for strengthening library automation initiatives and improving service delivery. Examining the systems currently in use and the implementation processes adopted will provide useful evidence for policymakers, library administrators, and other stakeholders seeking to modernize government libraries and enhance access to information resources. It is against this background that this study investigates the adoption and implementation of open source

library management systems in federal ministry libraries in Abuja, Nigeria.

Statement of the problem

Open source library management systems have become essential tools for automating library operations and improving the management of information resources in contemporary libraries. Federal ministry libraries in Nigeria are expected to adopt and implement these systems to modernize library services, enhance operational efficiency, and support the information needs of government employees. Despite government efforts to promote library automation through policy initiatives and the provision of technological support, the extent to which federal ministry libraries have adopted and fully implemented open source library management systems remains uncertain.

Evidence from the researcher's professional experience and preliminary observations in federal ministry libraries in Abuja indicates that the level of adoption and implementation of open source library management systems varies considerably across libraries. While some libraries have initiated automation projects, others continue to rely largely on manual library operations or have not progressed beyond the initial stages of implementation. These variations may be associated with differences in institutional commitment, technological infrastructure, funding, technical support, and staff capacity. Furthermore, a review of the available literature reveals limited empirical evidence on the adoption and implementation of open source library management systems in federal ministry libraries in Abuja, Nigeria. Most previous studies have focused on library automation in academic or public libraries, leaving government ministry libraries largely under investigated. This knowledge gap underscores the need for empirical evidence on the open source systems currently adopted and the implementation practices within federal ministry libraries. It is against this background that this study investigates the adoption and implementation of open source library management systems in federal ministry libraries in Abuja, Nigeria.

Research questions

The following questions are answered in the study:

1. What are the prevalent open source library management systems implemented for effective Information retrieval in federal ministry libraries in Abuja, Nigeria?
2. What are the stages of Implementation of open source library management system for effective Information retrieval in federal ministry libraries in Abuja, Nigeria?

Literature review

Evidence from previous studies shows that Koha is the most widely implemented open source library management system for enhancing information retrieval in academic libraries. Oyekale (2018) found that 90% of automated university libraries in Osun State adopted Koha, with most libraries reaching advanced stages of automation, indicating its widespread acceptance and suitability for library operations. Similarly, Baiju (2017) identified Koha as the preferred library management software among libraries in Kerala because of its comprehensive modules and flexibility compared to other software. George et al. (2021) further demonstrated that Koha provides extensive customization features, is cost effective, saves time, and promotes collaboration, making it an efficient platform for information retrieval and library service delivery. In contrast, Igbudu et al. (2020) reported mixed outcomes, revealing that although Koha

significantly improved cataloguing and classification operations, it had a negative influence on acquisition functions in public university libraries. This suggests that while Koha is effective in supporting core information organization and retrieval activities, its performance may vary across library operations depending on implementation practices and institutional contexts. Overall, the reviewed studies establish Koha as the dominant open source library management system because of its flexibility, affordability, rich functionality, and positive contribution to information retrieval, despite some operational limitations that require continuous improvement.

Empirical evidence suggests that successful implementation of open source library management systems (LMS), particularly Koha, depends on effective planning, adequate infrastructure, technical expertise, and institutional support. Omeluzor et al. (2012) reported that while Koha implementation at Babcock University Library demonstrated the feasibility of open source LMS adoption, persistent challenges such as erratic power supply and inadequate skilled manpower limited its effectiveness. Radebe (2017) provided a more comprehensive perspective by identifying key implementation stages, including collaborative planning, formation of implementation teams, system configuration, hardware and software enhancement, and successful data migration. This study emphasized that systematic planning and stakeholder involvement are critical for successful implementation. Tella et al. (2017) found that librarians had positive perceptions of Koha because of its flexibility, ease of use, and customization features. However, the study focused more on users' perceptions than the actual implementation process, while also reaffirming infrastructure and manpower constraints. Similarly, Basiru and Adebayo (2017) highlighted high staff satisfaction and utilization following Koha implementation but attributed this success to continuous staff training, networking competence, and collaboration with ICT units. Collectively, the studies indicate that effective implementation of open source LMS extends beyond software installation to include careful planning, staff capacity development, technical infrastructure, data migration, and sustained institutional support for improved information retrieval.

Theoretical framework

The Diffusion of Innovation (DOI) Theory developed by Everett M. Rogers (2003) underpins this study. The theory explains how innovations are adopted, implemented, and institutionalized within organizations over time. In this study, open source library management systems such as Koha, Evergreen, and NewGenLib are regarded as technological innovations that improve library operations and enhance information retrieval. Rogers identified five innovation attributes, namely relative advantage, compatibility, complexity, trialability, and observability, which influence the adoption of innovations. The theory also describes the organizational implementation process through the stages of agenda setting, matching, redefining and restructuring, clarifying, and routinizing, illustrating how innovations become integrated into routine organizational activities.

The DOI Theory is appropriate for this study because it provides a framework for understanding both the adoption and implementation of open source library management systems in federal ministry libraries. It aligns with the first research question by explaining the adoption of prevalent open source library management systems for effective information retrieval. According to the theory, the adoption of an innovation depends on its perceived relative

advantage, compatibility, complexity, trialability, and observability. The implementation of Koha by only a few federal ministry libraries suggests that the diffusion of open source library management systems is still limited and that adoption varies across the libraries. The theory also aligns with the second research question by explaining the stages through which open source library management systems are implemented and institutionalized. Rogers posits that organizations progress through successive implementation stages, beginning with agenda setting and matching, and advancing through redefining and restructuring, clarifying, and routinizing. The finding that most federal ministry libraries remain at the planning stage indicates that they are still in the early phase of the innovation process and have not yet fully integrated open source library management systems into their routine operations. Therefore, the Diffusion of Innovation Theory provides a sound theoretical foundation for examining the adoption and implementation of open source library management systems for effective information retrieval in federal ministry libraries in Abuja, Nigeria.

Methods

The descriptive survey research design was employed for this study. The descriptive survey was considered appropriate because this study sought to collect, describe and summarize data on the extent of implementation of open source library management system for effective information retrieval in federal ministry libraries in Abuja, Nigeria. The population of the study consisted of 135 staff, made up of 109 librarians and 26 systems analysts in the 46 federal ministries in Federal Capital Territory, Abuja, Nigeria (Human Resource Department of each Federal Ministry, 2023). The census sampling technique was used since the population was manageable. The questionnaire was the instrument used for data collection. The questionnaire was divided into two parts. Part A focused on the demographic information of the respondents, while part B on the two research questions. The instrument was validated by three experts, which was made up of two lecturers from the Department of Library and Information Science, and one lecturer from the Department of Science Education. To ascertain the reliability of the instrument, the researcher administered 20 copies of the instrument to 20 librarians in ministry libraries in Nassarawa State, Nigeria. The reason for using ministry libraries in Nassarawa State, Nigeria for the trial testing was because it is outside the area of the study but shares common boundaries with the area of the study. The reliability estimate was computed using Cronbach's alpha reliability coefficient and yielded coefficient index of 0.87. The copies of questionnaire were administered to the respondent's one-on–one by the researcher and five research assistants. Out of 135 copies of questionnaire distributed to the librarians and system analysts in the entire federal ministry libraries in the Federal Capital Territory (FCT), Abuja, 127 representing 94.1% were retrieved and analysed for the study. The data were analyzed using descriptive and inferential statistics. Research question 1 and 2 used 50% decision rule, thus, any item that scored up to 50% was considered implemented, while any item below 50% was considered not implemented.

Results

Research question one: What are the most prevalent open source library management system implemented for effective Information retrieval in federal ministry libraries in Abuja, Nigeria?

Table 1: Frequency and percentage of the most prevalent open-source library management system implemented for effective information retrieval in federal ministry libraries in Abuja, Nigeria (n=127)

S/N	Open-source library management system	Implemented	Not Implemented	Decision
1	ALAS	0(0%)	127(100%)	Not Implemented
2	TINLIB	0(0%)	127(100%)	Not Implemented
3	CDS/ISIS	0(0%)	127(100%)	Not Implemented
4	KOHA	13(10.2%)	114(89.8%)	Not Implemented
5	KLAS	0(0%)	127(100%)	Not Implemented
6	VIRTUA	0(0%)	127(100%)	Not Implemented
7	LIBERO	0(0%)	127(100%)	Not Implemented
8	MINISIS	0(0%)	127(100%)	Not Implemented
9	SLAM	0(0%)	127(100%)	Not Implemented
10	OPEN D–LIBRARY	0(0%)	127(100%)	Not Implemented
11	FEDORA	0(0%)	127(100%)	Not Implemented
12	ALICE 4 WINDOWS	0(0%)	127(100%)	Not Implemented
13	TAPIR	0(0%)	127(100%)	Not Implemented
14	GLAS	0(0%)	127(100%)	Not Implemented
15	READABLE	0(0%)	127(100%)	Not Implemented
16	AUTO LIBRARY	0(0%)	127(100%)	Not Implemented
17	Dspace	0(0%)	127(100%)	Not Implemented
18	X-LIB,	0(0%)	127(100%)	Not Implemented
	Grand Percentage	0.6%	99.4%	Not Implemented

Data presented in Table 1 shows the responses of librarians on the most prevalent open source library management system implemented for effective Information retrieval in federal ministry libraries in Abuja, Nigeria. From the results, 13(10.2%) of the federal ministry libraries in Abuja, Nigeria implemented Koha open source library management system for effective Information retrieval, while open source library management system such as ALAS, TINLIB, CDS/ISIS, KLAS, VIRTUA, LIBERO, MINISIS, SLAM, OPEN D–LIBRARY, FEDORA, ALICE 4 WINDOWS, TAPIR, GLAS, READABLE, AUTO LIBRARY, DSpace and X-LIB are not implemented in any federal ministry library in Abuja, Nigeria.

Research question two: What is the stage of implementation of open-source library management system for effective Information retrieval in federal ministry libraries in Abuja, Nigeria?

Data presented in Table 2 shows the responses of librarians on the stage of Implementation of open-source library management system for effective Information retrieval in federal ministry libraries in Abuja, Nigeria. From the results, majority of the librarians responded that, the implementation of open-source library management system is at the planning stage which is the first and foremost stage of software implementation. The implementation of library management system for online charging and discharging, online book reservation, automated serial management, online reference services, user registration, issue of overdue notice to borrowers, and institutional repository are all at the planning stage in all the federal ministry libraries in Abuja, Nigeria.

Table 2: Mean Response on the stage of Implementation of open-source library management system for effective Information retrieval in federal ministry libraries in Abuja, Nigeria

S/N		Full	Partial	Installation stage	Planning stage	$\bar{x}$	SD	Decision	Rank
	implemented for…								
1	Online public access catalogue	0	0	13	114	1.10	.30	Planning stage	1st
2	Automated acquisition process	0	0	13	114	1.10	.30	Planning stage	2nd
3	Online charging and discharging	0	0	0	127	1.00	.00	Planning stage	3rd
4	Online book reservation	0	0	0	127	1.00	.00	Planning stage	3rd
5	Automated serial management	0	0	0	127	1.00	.00	Planning stage	3rd
6	Online reference services	0	0	0	127	1.00	.00	Planning stage	3rd
7	User registration	0	0	0	127	1.00	.00	Planning stage	3rd
8	Issue of overdue notice to borrowers	0	0	0	127	1.00	.00	Planning stage	3rd
9	Institutional repository	0	0	0	127	1.00	.00	Planning stage	3rd
	Grand mean					**1.02**	**0.67**	**Planning stage**	

Table 3: Summary of ANOVA on the mean difference in the stages of Implementation of open source library management system for effective Information retrieval across the federal ministry libraries in Abuja, Nigeria

	Sum of Squares	Df	Mean Square	F	Sig.	Decision
Between Groups	39.677	45	.882	10.203	.000	Significant
Within Groups	7.000	81	.086			
Total	46.677	126				

P<0.05; **D:** Decision; **S:** Significant; **NS:** Not Significant

Results in Table 3 showed the results of one-way between groups ANOVA conducted to examine difference in the stages of implementation of open source library management system for effective Information retrieval across the federal ministry libraries in Abuja, Nigeria,

Discussion

The findings of the study revealed that, few federal ministry libraries in Abuja, Nigeria implemented Koha open source library management system for effective Information retrieval, while open source library management system such as ALAS, TINLIB, CDS/ISIS, KLAS, VIRTUA, LIBERO, MINISIS, SLAM, OPEN D–LIBRARY, FEDORA, ALICE 4 WINDOWS, TAPIR, GLAS, READABLE, AUTO LIBRARY, DSpace and X-LIB are not implemented in any Federal Ministry Libraries in Abuja, Nigeria. Koha is most prevalent implemented by few federal ministry libraries in Abuja, Nigeria. The federal ministry libraries in Abuja, Nigeria that have implemented open source library

management system as revealed by the findings are State House Library, Office of the Secretary to the Government of the Federation, Federal Ministry of water resources, Ministry of Justice, Ministry of Education, and public service institute. Hence, the implementation of open- source library management system is still low among federal ministry libraries in Abuja, Nigeria as only few has implemented Koha source library management system. This finding aligns with the DOI Theory, which explains that the adoption of an innovation depends on its perceived relative advantage, compatibility, complexity, trialability, and observability. The implementation of Koha by only a few libraries suggests that the diffusion of the innovation is still limited, with adoption varying across the federal ministry libraries. This is in accordance with that of Oyekale (2018) who found that 90% of automated university libraries in Osun State adopted Koha, with most libraries reaching advanced stages of automation, indicating its widespread acceptance and suitability for library operations. This shows that the most common among the library software adopted by most libraries in Nigeria is Koha integrated library management system.

The findings of the study revealed that, the implementation of open-source library management system for effective Information retrieval in federal ministry libraries in Abuja, Nigeria is at the planning stage which is the first and foremost stage of software implementation. This is because the study found out that the implementation of library management system for Online charging and discharging, Online book reservation, automated serial management, Online reference services, User registration, Issue of overdue notice to borrowers, and Institutional repository are all at the planning stage in all the federal ministry libraries in Abuja, Nigeria. However, online public access catalogue and Automated acquisition process is at installation stage in some federal ministry libraries in Abuja, Nigeria. Thus, few modules of the open source library management system have passed the first stage of implementation which is the installation stage. This result is consistent with the DOI Theory, which posits that organizations progress through distinct stages of innovation implementation, from agenda setting and matching to redefining and restructuring, clarifying, and routinizing. The predominance of the planning stage indicates that most libraries are still in the early phase of the innovation process and have not yet fully institutionalized open source library management systems into their routine operations. The finding conforms with those of Radebe (2017), Tella et al. (2017), and Basiru and Adebayo (2017), who reported that the implementation of open source library management systems is often gradual, with many libraries remaining at the planning or early implementation stages due to inadequate funding, insufficient ICT infrastructure, limited technical expertise, and inadequate staff training.

Conclusion

The study concluded that the adoption and implementation of open source library management systems in federal ministry libraries in Abuja, Nigeria remain low. Koha is the only prevalent open source library management system implemented by a few libraries, while most other open source systems have not been adopted. The implementation of library management system modules is largely at the planning stage, indicating that automation is still at an early phase.

The following are recommended based on the results of the study:

1. Federal ministry libraries should adopt and implement open source library management systems,

particularly Koha, to improve information retrieval and library service delivery.

2. The federal government and relevant ministries should provide adequate funding, ICT infrastructure, and technical support to facilitate the implementation of open source library management systems.
3. Continuous training and capacity building should be organized for librarians and ICT personnel to enhance the successful implementation and effective utilization of open source library management systems.

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