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Full Length Research

Suitable Library Buildings and Operations in the Artificial Intelligence (AI) Era in Nigeria: The Case of Private Universities in Oyo State

[1]Adebola Aderemi Olatoye and [2]Bologun Opeyemi Olufunmilayo

[1]The Nigerian Baptist Theological Seminary, Ogbomoso, Oyo State.
Corresponding author's E-mail: adebolaadeyemo0108@gmail.com Tel.+2348038853216
[2]Osun State University, Osogbo, Osun State. E-mail: lamopeyemi2714@gmail.com, Tel. +2347067938113

The study was on the suitable library buildings and operations in the artificial intelligence (AI) era in Nigeria, with focus on private universities in Oyo State. Specifically, the study looked at the library operations in the AI era; the suitability of library buildings for AI operations; and the setbacks to having suitable library buildings to accommodate new trends in technology. The study adopted the descriptive survey design, with a population of 31 librarians in private universities in Oyo State, the study adopted a total enumeration technique; the questionnaire as the instrument was for data collection and was subjected to validity and reliability; collected data were analysed using tables, frequencies, and mean. The findings show that library operations during the AI era are basically same with the pre AI era, with a little difference in mode off operations and scope of coverage; the libraries have dedicated space for expansion and accommodation of innovative technologies like AI; but the setbacks to ensuring these are Cybersecurity threats, systems failure, and limited library budget. The research recommended that library managements should expand their sphere of coverage to adopt and utilize AI.

Key words: Artificial intelligence, Library building, Library operations, AI era.

INTRODUCTION

The library is indeed a growing organism. The most notable aspect of librarianship that is evident to be growing is the application of technologies to library processes. These technological advancements have revolutionized the way that modern libraries operate, provide services, and interact with their clienteles. These technologies have transformed the library landscape, offering several benefits and numerous opportunities for innovative service delivery. The use of artificial intelligence (AI) in libraries is just one of such technological advancements in modern day libraries. AI has the potential to revolutionize the library services even further, thus enhancing users' satisfaction, and improve all-round efficiency for the library. This is because AI simply entails the application of machines in carrying out intelligent works like humans. Thus, through AI, the library can render certain services more accurately, like selective dissemination of information to students, researchers, and faculty; current awareness services, cataloguing, indexing, abstracting, and a

lot more. But for academic libraries to embrace and utilise AI, they must have functional buildings that allows for the application of technologies initiatives in information processes (Oguedoihu, 2023).

Library are currently required to be smart, that is they allow for automation and application of technological advancement in the operations, functions and services of the library. Yunus and Ismail (2024) opined that smart libraries are built to ensure that they continually evolve to accommodate novel trends and meet the ever changing needs of the library users. Since it has become necessary for libraries to be smart and accommodating, the need for having sustainable library designs cannot be overlooked. The need for a suitable library must factor in the issues of sustainability, comfort, functionality, and size (Miao, et. al, 2024). To this effect, modern libraries are built with the library users at heart; library users who would want to get information at the comfort of their houses may be reluctant to visit the physical library any other time they need information (Akande, et. al, 20224). To such scenarios, library buildings may not necessarily have reasons to be mighty, if emphases are changing from holdings to access. Thus, the application of AI to library processes, in even small but functional libraries, that are designed to accommodate novel technologies, will make the access to information easier.

Research Objectives

The aim of the study is to investigate suitable library design and operations in the artificial intelligence (AI) era in Nigeria: the case of private universities in Oyo State. the specific objectives are:

i.   To determine the library operations in the AI era
ii. To determine the suitability of library buildings for AI operations
iii. To identify the setbacks to having suitable library buildings to accommodate new trends in technology

Literature Review

Library operations in the era of AI are typical the same with the eras before the invention and introduction of AI into librarianship; the difference being in the mode and scope of operations. Omame and Alex-Nmecha (2020) noted that the ultimate promise of AI in libraries is to develop computer systems or machines that think, behave and rival human intelligence; as the application of AI to librarianship has become pervasive, spanning through reference services, book reading, shelf-reading, virtual reality for immersive learning. Ajakaye (2022) noted that other aspects of librarianship where AI are applied ranges from book filing to book delivery; and the introduction of AI to libraries brought about new possibilities, and holds immerse potentials for revolutionising library operations and enhancing user experience (Subaveerapandiyan, 2023).

Library buildings in AI era are expected to be eco-friendly and promote diversity, inclusion, and equity. Nnatu, Okechukwu and Chinemerem (2024) underscored the necessity of tailored intervention to promote sustainability and inclusion in libraries in the digital age, due to the nuanced interplay of strategic initiatives that allow libraries meet the evolving needs of their user communities. Akande, et. al (2024) noted that the rapid transition in technology is changing users' needs and is forcing the long term redesign of academic libraries buildings to meet these changing needs, though libraries are yet to meet up with the expected change. In meeting these users' needs, Chalukya (2021) noted that the libraries must be ecologically friendly, as they promote sustainability and environmental awareness. Dehkordi, Sureshjani and Gholami (2025) revealed that architecturally sustainable designs are very important, not only to libraries but to psychological and social needs of the elderly, in improving their quality of lives.

METHODOLOGY

The study adopted the descriptive survey research design. The population of the study is the librarians in private university libraries in Oyo State. The study focuses on private universities because they often have smaller library buildings, thus requiring them to have suitable library designs that allow for the effective management of the limited library space for numerous library services and operations, including the operations of AI technologies. The study adopted the total enumeration technique because of the sizeable and manageable number of the population. The research instrument is the self-structured questionnaire that was subjected to validity and reliability, using a pilot study to test for the reliability. Collected data were analysed using statistical tools of tables, frequencies, and mean.

Table 1: Study Population

Private University in Oyo State	Number of Librarians
Ajayi Crowther University, Oyo State	10
Atiba University, Oyo State	3
Kola Daisi University, Oyo State	3
Lead City University, Oyo State	10
Precious Cornerstone University, Oyo State	5
Total	**31**

Table 2: Cronbach's Alpha Coefficients for Reliability

Variables	Coefficients
Library operations in AI era	0.92
Suitable Library Building	0.84
Overall Scale	**0.88**

Presentation of Results

The total number of responses to the questionnaire that was hosted online was 28, giving a response rate of 90%. The analyses of the research are based on the returned copies of the questionnaire. From the tables below, SA (strongly agree), A (agree), D (disagree), and SD (strongly disagree) are the four Likert scale used to measure responses from respondents.

Table 3: Library Operations in the AI era

Library Operations	SA	A	D	SD	Mean
AI-enhanced functions and services					
My library …					
… adopts virtual reference services to provide 24/7 support to users	7	7	8	6	2.54
… uses AI to engage in personalized and selective dissemination of information based on user preferences and reading history	8	7	6	9	2..64
… apply AI during cataloguing and classification functions					
… uses AI to analyse digital collections to provide insights into usage pattern	15	8	3	2	3.29
	4	6	7	11	2.11
Grand Mean					**2.65**
AI-powered library management					
My library …					
… utilises AI to optimise circulations, thereby reducing errors	16	7	4	1	3.36
… uses AI generated reports for decision making	13	1	2	2	3.25
Grand Mean					**3.31**
AI-driven user engagement					
My library …					
… uses AI-powered social media handles to maintain a strong online presence to engage with users	15	7	2	4	3.18
… uses AI to determine user experiences in order to create a more suitable, intuitive, user-centered library space	7	13	2	6	2.75
Grand Mean					**2.97**

Criterion Mean: 2.5

Table 3 revealed that the library operations in the AI era are subdivided into functions and services, library management, and user engagement.

For the functions and services, the private university libraries in Oyo State apply AI during cataloguing and classification (Mean = 3.29), they use AI to engage in personalized and selective dissemination of information to users (Mean = 2.64); they also adopt virtual reference services to provide 24/7 support to users (Mean = 2.54); but they scarcely use AI to analyse digital collections to provide insights into usage pattern (Mean = 2.11). However, the Grand

Mean for the section on functions and services is 2.65, showing that the private university libraries in Oyo State use AI for library functions and services, as the Grand Mean is higher than the criterion Mean of 2.5; hence the assertion that AI is used for library functions and services is accepted.

The Table also revealed for library management that AI technologies are utilised for optimising circulations, and reduce errors (Mean = 3.36), and AI technologies are also used for generating reports for decision making (Mean = 3.25). These showed that AI technologies are highly utilised for library management operations in private university libraries in Oyo State, as the Grand Mean of 3.31 is higher that the criterion Mean of 2.5; hence the assertion that AI is used for library management is accepted.

Table 3 also revealed that, for library user engagement, private university libraries in Oyo State use AI-powered social media handles to maintain a strong online presence to engage with users (Mean = 3.18); and they use AI to determine user experiences in order to create a more suitable, intuitive, user-centered library space (Mean = 2.75). By implication, AI technologies are adopted and utilised by private university libraries for library user engagement, with a Grand Mean of 2.97 which is higher that the criterion Mean of 2.5; hence the assertion that AI is used for library user engagement is accepted.

Table 4: Suitability of Library Designs for AI operations

Suitability of Library Designs for AI Operations	SA	A	D	SD	Mean
My library has dedicated spaces for AI-powered devices	12	13	5	0	3.46
My library is flexible enough to accommodate AI-powered devices	16	4	3	5	3.11
My library has dedicated IT support team for AI operations	9	11	7	2	3.04
There are plans on ground to develop and implement AI-powered services in my library	14	3	2	9	2.79
Grand Mean					**2.85**

Criterion Mean: 2.5

Table 4 showed the suitability of library designs for AI operations. The study revealed that libraries in private universities in Oyo State have dedicated spaces for AI-powered devices (Mean = 3.46); also, libraries in private universities in Oyo State are flexible enough to accommodate AI-powered devices (Mean = 3.11); in like vein, the libraries have dedicated IT support team for AI operations (Mean = 3.04); and they have plans on ground to develop and implement AI-powered services in my library (Mean = 2.79). Thus, with a Grand Mean of 2.85 for suitability of library design for Ai operations, as against the criterion Mean of 2.5, the research states that private university libraries in Oyo State have suitable library designs for AI operations; that is, these libraries are smarts, and they have accommodation for new AI technologies in the library.

Table 5: Setbacks to Suitable Library Buildings

Setbacks to Suitable Library Buildings	SA	A	D	SD	Mean
Technical setbacks					
Connectivity issues	19	7	2	0	3.61
Systems failure	14	9	3	2	3.29
Cybersecurity threats	18	5	1	4	3.32
Obsolescence arising from rapid technological advancement	16	6	3	3	3.25
Grand Mean					**3.37**
Financial setbacks					
High implementation cost	9	8	4	7	3.0
High cost of maintenance and upgrade	7	11	7	3	2.79
Limited library budget	18	8	0	2	3.5
Grand Mean					**3.1**

Criterion Mean: 2.5

Table 5 revealed that the setbacks private university libraries face in ensuring suitable library buildings that can accommodate smart operations in the AI era. These are divided into technical setbacks, and financial setbacks.

For the technical setbacks faced by private university libraries in Oyo State in ensuring that their library buildings are suitable for AI operations, connectivity issues (Mean = 3.61) was a major challenge, with issues like poor network signals, unreliable internet connectivity, or network outages; another major technical setback was Cybersecurity threat (Mean = 3.32) which could be in the form of hacking, data breaches, or data leakages; systems failure (Mean = 3.29) was another setback militating against private university libraries in Oyo State from having smart libraries with suitable

library designs for AI operations; obsolescence arising from rapid technological advancement (Mean 3.25) also stood out as a technical setback to suitable library designs for AI operations. These showed that private university library buildings in Oyo State are faced with technical setbacks, as the Grand Mean of 3.37 is higher than 2.5 which is the criterion Mean.

For the financial setbacks, the major setback was limited library budget (Mean 3.5); another financial setback was high implementation cost (Mean = 3.0); and high cost of maintenance and upgrade (Mean = 2.79). These showed that private university library buildings in Oyo State are faced with financial setbacks, as the Grand Mean of 3.1 is higher than 2.5 which is the criterion Mean.

Discussion of Findings

Findings of the study revealed that the library operations of private university libraries in Oyo State, in the era of AI are cataloguing and classification, personalized and selective dissemination of information, virtual reference services, circulation services, generation of reports for decision making, use of social media handles for user engagement, and for the determination of user experiences. But the libraries do not use AI for analysis of digital collections. These findings agree with Subaveerapandiyan (2023) who investigated the application of artificial intelligence (AI) in libraries and its impact on library operations review; and reported that artificial intelligence in applications in libraries holds potential for the revolutionising of library operations and enhancing user experiences, highlighting the diverse ways AI technologies are employed in library operations like information retrieval, automation of library routine tasks, personalisation of user interactions, and the provision of innovative services.

Findings of the study revealed the suitability of library buildings for AI operations in private university libraries in Oyo State. These findings revealed that the libraries have dedicated spaces for AI-powered devices; they are flexible enough to accommodate AI-powered devices; and they have dedicated IT support team for AI operations. These findings agree with Miao, et. al (2024) who investigated sustainable architecture for future climates: optimizing a library building through multi-objective design, and reported that library buildings of modern generations are more compliant to adaptabilities, reducing energy consumptions, and enhancing library users' comfort.

Findings of the study revealed the setbacks to suitable library buildings in the AI era are connectivity issues, Cybersecurity threats, systems failure, obsolescence arising from rapid technological advancement, limited library budget, high cost of implementation, and high cost of maintenance and upgrade. These findings agree with Ajakaye (2022) who worked on the applications of artificial intelligence (AI) in libraries, and noted among the challenges that financial uncertainty arising from dwindling fund, resistance to change from librarians, limited technical know-how of library staff on AI, abuse of users' privacy, limited vocabulary of the chatbots, and lack of understanding of users' emotions are some of the challenges faced when applying AI to library operations, processes, services, and functions.

CONCLUSION

Modern library buildings ought to be built to accommodate technological innovations and advancements; that way, these technological advancements like AI can be adopted into library operations like cataloging and classification, personalized and selective dissemination of information, virtual references and the likes. To achieve theses, libraries must have dedicated space for library development and expansion, to cater for the new technologies in the library; but the setbacks to these technological innovations in librarianship are Cybersecurity threats, system failures, obsolescence of technology, and slim library budget.

RECOMMENDATIONS

Based on the findings and conclusion of the research, the following recommendations are made:

i.   Library managements in private universities in Oyo State should strive to expand their sphere of coverage on the adoption and application of AI technologies in library processes; that way, all spheres within the library will be more effective and efficient in the carrying out of their statutory functions and services.

ii.   The dedicated spaces for library expansion and accommodation of novel technologies like AI should be utilized for the purposes they were initially created; so that the library will be purpose driven and focused on the actualization of stipulated goals and objectives.

iii.   The library management should work in synergy with the ICT units of the universities to ensure the security and safety of digital information, within the limited budgetary allocations of the library; that will ensure the trust of the information stakeholders on the library, as a digital repository of information.

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