Journal of Computing, Science &Technology
https://focjournal.unidel.edu.ng/
editorjcst@unidel.edu.ng
ISSN: 3043-6818 Print
https://focjournal.unidel.edu.ng

The Advent of Robotics and Artificial Intelligence in Libraries: Perceptions, Readiness and Attitudes of Librarians in Nigeria Universities.

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Article Info

Date Received: xx-xx-2024
Date Accepted: xx-xx-2024

Keywords:

Robotics, artificial intelligence, automation, perception

ABSTRACT

This paper investigated the advent of robotics and artificial intelligence in libraries: librarians' perception, readiness, and attitude in some selected Universities in Nigeria's south-south and south-east geopolitical regions. This was done through a proportionate sampling technique of twenty (20) selected University libraries. A 27 itemed adopted questionnaires was developed and used in the study. This was validated by experts and having a reliability coefficient of 0.80 was used to collect information from the institutions and librarians. A 4-Likert scale was used to measure the behaviours, opinions and attitudes of the respondents towards the posed questions. The mean were calculated together with the cluster mean. Findings of this study with review of literature support, revealed that the librarians from the twenty (20) institutions agree that the automation of library services with robotics and artificial intelligence is a relief from some difficult and mundane tasks. Furthermore, findings also, showed that most librarians are not receptive to the advent of robotics due to threat to loss of their jobs and redundancy. The findings of this study indicated that robotics are very relevant in unlimited coverage of academic library service delivery in Nigeria and improved user satisfaction is urgently needed.

1.0 INTRODUCTION

In recent years, the advent of computers or automation has been witnessed in many sectors and has brought about the application of artificial intelligence to every human operation, including the libraries. Automation is an already existing phenomena but the arrival of technology in Nigerian libraries. For some libraries in the developed countries, there is a felt presence of automation in major library operations in different library sections. With the improvement in computers and with the advent of Artificial Intelligence, computers have come handy to improving the ways of doing things [1]. In most recent years, the introduction and the coming of the robots and artificial intelligence has witnessed a great surge of interest and usability in the library especially the developed countries of the world especially the South Africa, USA, Japan, China, India, and other developing countries such as Nigeria,

Cameroun, Togo and other under-developed countries are yet to welcome and apply the use of artificial intelligence and robotics in their library routine operations. Countries such as South Africa and china have long been in use of these intelligence in their libraries, machines which shows the reception and application of such machines. However, there are obviously , series of technological breakthrough that have been achieved in recent years such as computing power, higher capabilities of memory for big data, cloud computing, and advances in robotics and artificial intelligence have expanded, [2]. In addition, [3], applauded the high impressive success achieved through robotics even though they are incomparable to humans but foresees and argues the future of automation of all human endeavours. Today, in the history of man in the developed countries such as U.S.A., Japan and China. robotics have taken up significant roles in some of our libraries. Librarians undoubtedly, never appreciate the sudden idea, arrival and usability of robotics and artificial intelligence in libraries. Librarians doubt the replacement and rout of these intelligent machines in library tasks hence, the unreceptive perception and un-readiness towards the arrival and application of them, [4]. To some librarians, it is an abnormal practice since many graduates of librarianship are still unemployed hence, the rejection and perception as threat to job loss. In similar percept, some librarians in Nigeria doubt the total coverage of these intelligent machines in all the sections and aspect of these library riles and services especially in academic libraries, being a research oriented library, librarians also argue the functionality and impact of these robots and artificial intelligence in these area of research hence the unwelcomed hands of these machines. Moreover, the rapid state of unemployment in the area of librarianship is a cause for concern which questions the future of librarians job engagement in Nigeria. This situation has given rise to the

poor reception and unwillingness of Nigerian librarians to the intelligence of machines. Although in theory, a few librarians speak in favour of robotics and artificial intelligence in academic libraries but with undesired implementations and acceptability in practice. Furthermore, the advent of robotics and artificial intelligence have continued to be an unwelcomed idea in practice as some Nigerian librarians argue over the delay of services and other related operations peradventure a breakdown of those machines occur .

Recently, many robots have been introduced in libraries of the developed world. As opined by [5], one prominent example of robots introduced is "book stacking robot" called "Mr.

Darcy", who greets patrons on entrance to the library. Robots have been a popular feature of science fiction for decades within the term 'robot' first being used in 1920s [6]. The intelligent machines are taking over almost all human functions due to the rapid extension of routine mechanical works. Historically, robot activities are very impressive in our world today. They perform search and rescue operations, mining, bomb disposals and advanced data analysis [7]. [8], noted that robots are used in libraries for real-time browsing of printed materials through a web interface. The user will engage the system, which in turn, will initiate a robot that will retrieve the requested item. Unfortunately in Nigerian universities there seems to be no evidence of robot assisted agents, which imposes difficult tasks to staff and students in using library facilities.

1.1 Literature Review

Artificial intelligence will accelerate the evolution in the way people look for information at the expense of librarians (IFLA Library Policy and Advocacy Blog, 2018). The search engines and search strategies have smarter searching through AI, thereby saving the librarians the long-time used in searching for information for users. A good librarian, through working with a user, can provide a much better tailored service, potentially using up time freed up by using AI (IFLA Library Policy and Advocacy Blog). [8], cited by IFLA noted that AI makes libraries and librarians more valuable rather than less because it opens up some truly exciting possibilities to do more work, already in collections as long as they are digitized ,open access

In contribution to the foregoing, another scholar[9] pointed out that since the industrial revolution, roles that were once exclusively performed by humans have been slowly but steady replaced by some form of automated machinery. In support of this assertion, it was suggested that even if robots are capable of carrying out the same jobs as humans, they may not be able to provide the equivalence of the human 'touch' that many people look for, and this could be key to their acceptance. It is also, pertinent to note that the use of intelligent machines has not been easy but with some challenges too. In agreement to this, [10], lamented, "the spectre of mass joblessness as machines displaced workers had incited fear many times in the past; retrospection to Britain's Luddite Uprising in 1812- but in the 1950s, and 60s, and the concern was especially acute and was prominent and intellectually capable individuals. The range of real-world –robots and the jobs they do is extremely broad and illustrates that there are few areas of human endeavour that have not, to some extent, already benefitted from robotics technology. European Commission (2012, 2015) surveys also, identified that the variable of whether respondents had used a robot had an influence on their general attitudes towards robots, with those who had generally being more positive towards their potential users. As academic libraries provide a growing array of digital library services and resources, they continue to acquire large quantities of printed materials. This combined pressure of providing electronic and print-based resources and services has led to severe space constraints for many libraries. [10] in a study observed that while libraries particularly in developed countries have accepted and use artificial intelligence technologies; those in developed countries are still struggling to find their feet. The author further lamented that despite all these AI potentials in university libraries, universities libraries in Nigeria are yet to adopt and implement AI perhaps, this might be due to low level of awareness and perception of AI's relevance in libraries, as studies relating artificial intelligence to librarianship is very low. The study further stated that robots technology can effectively solve some problems in library management and services, and improve user satisfaction to a certain extent. It is becoming gloomy for graduates of librarianship to be gainfully employed even though unemployment is generally on the increase globally but especially, in Nigeria. The presence of robots is gradually gaining grounds in developed worlds. It is difficult enough to compete with other qualified candidate who are human – but, with increasing automation, librarians need not worry about being replaced by robots.

Another study was carried out on the awareness and perception of the artificial intelligence in the management of the university libraries in Nigeria, by [11] Findings revealed that academic librarians are aware of the existence of AI usage in the university libraries and that the fear of job loss is the major constraint they face in the adoption of the technologies; even though they are aware that the innovative technologies will enable effective User satisfaction.. Further findings showed that academic librarians were taught that the adoption of artificial intelligence in the library does not translate to the loss of jobs. To give a user-satisfactory service, libraries must evolve by responding to changes from time to time [12]. It is evident that the industrial robots is on the increase. This is supported by the international Federation of Robotics (2020) who based on their data, showed that the operational stock of industrial robots has triple over the Past decade with more than three million robots in use across various industries by the end of 2020. Research findings from [13], indicated that university students in the United States of America responded positively to AI adoption and use in university libraries, probably because of the facilitating

nature of technology. [14], further emphasizes on the need for university libraries to embrace AI technologies in other to offer improve services to users. While alluding tom the benefits of AI in libraries, [15], reported that AI would enable libraries to address the challenges of operational inefficiency, technological disadvantage, and the inability to demonstrate their value benefits to all the Stakeholders. In support of the foregoing, [16] noted that using AI in academic libraries will help analyse big data, create metadata, and improve search translation and integrating Search items across contents. The researcher adds that this will make libraries more accessible, available and allow the staff to answer users 'queries on artificial intelligence use. The application of AI cuts across various areas of human endeavours which include Speech recognition, machine translation, and serving as robots in place of librarians. From the above Assertion, it could be inferred that the adoption of AI in library operations will increase the efficiency and effectiveness of libraries coupled with boosting the image of the libraries. There are three main Aspects by which AI can change the library operations.

In similar development, [17] enlisted different areas where AI technology can enhance library services and operations which include circulation services, shelving of books, cataloguing of library materials, among others. [18], assert that many academic libraries in developed countries especially, have embraced AI for diverse library operations particularly in circulation and reference services. They also noted that AI has been in use at Mentor Library in Ohio, since 2009 and has evidently impacted the library. The research laments over the poor exposure to ICT related skills of librarians which will certainly hinder the well of this intelligent machines into the libraries. This was supported by emphasizing that only a few librarians possess the needed skills to promote AI's practical use and its adoption promotes human thinking and augment practical usage. Hence, artificial intelligence enhances libraries' operational efficiency by optimizing collection analysis, visualisation, preservation and reducing the expenses associated with service delivery.

2.0 Materials and Methods

Both qualitative and quantitative methods were also adopted for the research in order to obtain an unbiased results. 40 librarians were randomly selected from 20 (twenty) universities in southern region of Nigeria. The respondents were free to pick more than one answer from the given items. The academic libraries were selected based on their ICT compliance, availability of staff and infrastructure which are facilitators of robotics and AI use in academic libraries.

3.1 Simple Random Sampling

This research work employed simple random sampling to get the data from the universities. It is a probability sampling or chance sampling. This type of sampling was used because of the many institutions in Nigeria. In Nigeria, there are 77 public universities owned by both federal and state governments, while 50 of the universities are owned by private individuals and entities.

3.2 Population Size

By applying random sampling, 20 States, federal, and privately owned universities in the South-South and South-East regions of Nigeria were selected for this research. Table 1 shows the names of the universities.

Table 1: 20 Federal and State and Private Owned Universities in South-South and South-East

S/N	University
1	Federal University of Technology Owerri
2	Michael Okpara University of Agriculture Umudike
3	Abia State University, Uturu
4	Clifford University
5	Niger Delta University
6	Rhema University
7	Imo State University
8	Kingsley Ozumba Mbadiwe University
9	Hezekiah University
10	Akwa Ibom State University
11	University of Uyo
12	University of Calabar
13	University of Port Harcout
14	Ignatius Ajuri University
15	Rives State University
16	Anambra State University
17	Nnamdi Azikiwe University
18	Enugu State University
19	University of Nigeria Nsukka
20	Federal University Ndufu Alikwo

3.3 Research Questions

In line with the objectives, the study is guided by the following research questions:

(1) What is the level of awareness of librarians on the use of robots and AI in academic libraries?
(2) What is the perception of academic librarians on the use of robotics and artificial intelligence?
(3) To what extent are librarians ready for the coming of robotics and intelligent machines in academic libraries?
(4) How is the attitude of librarians on the use of robotics and AI in academic libraries?
(5) What do librarians think about the impact of robotics and artificial intelligence in academic libraries?

3.4 Research Hypotheses

The following null hypotheses will be tested at 0.05 level of significance.

Ho1: There is no significant level of awareness of librarians on the use of robots and AI in academic libraries.
Ho2 There is no significant perception of librarians in academic libraries on the use of robotics and AI in academic libraries.
Ho3: The extent of readiness of librarians on the use of robotics and AI is not significant.
Ho4: There is no significant attitude of librarians on the use of robotics and AI in academic libraries.
Ho5: There is no significant impact of robotics and AI in academic libraries.

3.5 Algorithm of Cluster Mean

1. Choose the number of clusters k. The first step in k-means is to pick the number of clusters, k.
2. Select k random points from the data as centroids. ...
3. Assign all the points to the closest cluster centroid. ...
4. Re-compute the centroids of newly formed clusters. ...
5. Repeat steps 3 and 4.

3.5.1 Mean Calculation

$$X = \Sigma \frac{x}{n} \quad (1)$$

Where x is the total of scores and n is the total number of items in the list

3.5.2 Cluster Mean Calculation

$$\text{Cluster-Mean} = \sum \frac{X}{N} \quad (2)$$

4. Experimental Results

Using the research questions, results were calculated by employing equation 1 to find the mean and equation 2 to find the cluster mean as depicted in Tables 2, 3, 4, 5 and 6 based on the questionnaires

4.1 Research Question one

To what extent do librarians in Nigerian universities accept robotics and AI in academic libraries?

Note: A=Accepted R=Rejected

Table 2: level of awareness of librarians on the use of robots and AI in academic libraries

S/N	To what extent did librarians accept;	VGE	GE	LE	NE	Total	mean	R/A
1.	Regular conferences and seminars	4	3	3	-	37	3.7	A
2.	Getting knowledge Through the Internet	2	4	2	2	26	2.6	A
3.	Listening to radio?	1	5	2	2	25	2.5	A
4.	Watching related AI documentaries on television?	3	5	2	-	31	3.1	A
5.	Reading of AI textbook?	2	4	2	2	26	2.6	A
6.	Interaction with AI Experts?	1	5	2	2	25	2.5	A
	Cluster mean						2.83	

4.2 Research Questions two

(1) What is the perception of academic librarians on the use of robotics and AI?

Table 3: Perception of academic librarians on the use of robotics and AI

s/n	To what extent did librarians accept Robots and AI?	VGE	GE	LE	NE	TOTAL	R/A
7	Aware of robotics and AI?	3	2	1	29	2.90	A
8	Not aware of application of robotics and AI?	1	3	2	27	2.70	A
9	Implementation AI and Robotics is too hard?	2	2	-	30	3.0	A
10	Robotics and AI may not work effectively in the University libraries?	1	4	1	25	2.50	A
11	Manpower may be a problem in the management?		4	2	21	2.10	R
12	University policies may not warrant robotics and AI in the libraries?	1	3	2	2	2.60	A
13	Security issues may be compromised?	1	3	1	24	2.40	R
	Cluster mean					2.6	

4.3 Research Question Three

To what extent are librarians ready for the coming of robotics and AI in academic libraries?

Table 4: The extent that librarians are ready for the coming of robotics and AI in academic libraries

S/n	To what extent do subjects Ready to accept	VGE	GE	LE	NE	Total	X	R/A
14	Not ready?	4	4	2	-	30	3.0	A
15	Very much ready?	2	3	3	2	27	2.70	A
16	Waiting for directives?	2	4	2	2	28	2.80	A
17	Need further clarification on the subject matter?	2	3	3	2	27	2.70	A
	Cluster mean						2.80	

4.4 Research Question Four

How is the attitude of librarians on the use of robotics and AI in academic libraries?

Table 5: The attitude of librarians on the use of robotics and AI in academic libraries

S/N	The attitudes of librarians robots and AI	VGE	GE	LE	TOTAL	X	R/A
18	High expectation?	3	4	2	29	2.90	A
19	Low expectation?	1	3	2	25	2.50	A
20	Needs more time to adapt.	2	4	3	27	2.70	A
21	Needs more training	2	3	3	25	2.50	A
22	Awaiting commencement by the university.	1	2	2	19	1.90	R
	CLUSTER MEAN					2.50	

4.5 Research Question five

What do librarians think about the impact of robotics and AI in academic libraries?

Table 6: What do librarians think about the impact of robotics and AI in academic libraries?

S/N	To what extent do librarians think about the impact of robotics and AI	VGE	GE	LE	NE	TOTAL	X	R/A
23	A tool for improving academic standard?	2	3	3	2	25	2.50	A
24	Application that could place them out of job?	1	3		2	23	2.30	R
25	Technological innovation that could help ease their work?	2	2	4	4	22	2.20	R
26	Technology that is seamless in learning?	2	3	2	2	25	2.50	A
27	A tool that could reshape the academic libraries?	1	5	3	2	25	2.50	A
	Cluster mean						2.40	

5. Result Discussion

Results of data analysis presented in Table 2 showed that librarians who go for regular conferences and seminars are very much aware of use of robots and AI in academic libraries to very great extent.

This was shown by the cluster mean which had a value of 2.83. For the individual items a regular conferences and seminars had mean 3.7 and was accepted. Getting knowledge through the internet had mean 2.6 and was accepted. Listening to radio had mean 2.5 and was accepted. Watching related AI documentaries on television had mean 3.1 and was accepted. Reading AI textbooks had mean 2.6 and was accepted. Interacting with AI experts had mean 2.5 and was accepted.

Results of data analysis presented in Table 3 shows that librarians are aware of robotics and artificial intelligence. This was shown by the cluster mean which had a value of 2.60. From the table, awareness of robots and artificial intelligence had mean of 2.90 and was accepted. Implementation of robotics and AI on libraries had mean 2.70 and was accepted. Robotics and artificial intelligence may not work effectively in the University libraries had 2.50 and was accepted. Manpower may be a problem in the management had mean 2.10 and was rejected. University policies may not warrant robotics and AI in the libraries had mean 2.60 and was accepted. Security issues may be compromised on the use of robotics and AI had mean 2.40 and was rejected.

Results of data analysis presented in table 4 shows that librarians are not ready to accept robotics and AI in libraries. This was shown by the clusters mean which had a value of 2.80. From not ready had mean 3.0 and was accepted. Very much ready had mean 2.70 and was accepted. Waiting for directives had mean 2.80 and was accepted. Need further clarification on the issue had mean 2.70 and was accepted.

Results of data analysis presented in table 5 show that the librarians have high expectation on the use of robotics and AI in the libraries. This was observed from the cluster mean which had a value of 2.50. High expectation had a mean of 2.90 and was accepted. Low expectation had a mean of 2.50 and was accepted. Needs more time to adapt with robotics and AI had mean 2.70 and was accepted. Needs more training had mean of 2.50 and was accepted. Awaiting commencement by the University had mean 1.90 and was rejected.

Results of data analysis presented on table 6 show that robotics and AI are tools for improving academic standards. This was observed from the cluster mean which had a value of 2.44. From the table robotics and AI for improving academic standards had mean 2.50 and was accepted. Application that could place them out of job had mean 2.30 and was rejected. Technological innovation that could help ease their work had mean 2.20 and was rejected. Technology that is seamless in learning had mean 2.50 and was accepted. A tool that could reshape the academic libraries had mean 2.50 and was accepted.

6. Conclusion

The research examined the advent of robotics and artificial intelligence in libraries: perceptions, readiness and attitudes of librarians in twenty (20) selected private, state and federal universities in the South-East and South-South geopolitical zone of Nigeria among some selected librarians as respondents. The findings of this study revealed that academic libraries academic librarians are not unaware of robotics and artificial intelligence implementation in the university libraries. It also revealed that some librarians are eager to start the use of robotics and AI tools in their libraries but unfortunately, the lackadaisical attitudes of some university management have hindered the introduction and implementation of these AI tools in our libraries. The study therefore concludes extensively that robotics and AI are way to go in enhancing the performance and efficiency of librarians and academics in tertiary institutions. The study concludes by recommending that unit that involves much enquiry should continually be manned by humans and not robots. Librarians should erase the threat to loss of job as the coming of robots enhances automation relating to many sections of operation that are undesired by humans.

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