



Artificial Intelligence in Libraries and Users Satisfaction in Higher Institutions in Nigeria

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ABSTRACT

The study adopted a correlational research design to find out the relationship between Artificial Intelligence in Libraries and Users Satisfaction in Higher Institutions in

Nigeria. The study covered six higher institutions with twelve Departments in Nigeria. The population of the study comprises of 300 lecturers and 3, 200 students from twelve Departments of different levels. A random sampling technique was adopted and Krejcie and Morgan method was used to determine the sample size of 346. A self-designed instrument was used with a four point scale. Based on the findings of this study, it is concluded that there was high level of roles played by artificial intelligence in the delivering of libraries services and high level of satisfaction by the users of artificial intelligence in the libraries of higher institutions in Nigeria. Among other things, the study recommends that libraries should intensify efforts in adopting artificial intelligence in the delivery of libraries services for libraries users to gain very high level satisfaction.

Keywords: *Artificial intelligence, Libraries, Users' satisfaction and Public higher institutions.*

1. INTRODUCTION

The higher institutions libraries are seen as the heart of the institutions because of the essentialities of the services they provide. In higher institutions, the four major infrastructures are laboratories, equipment, teachers/classrooms and libraries that contain rich and balanced information resources that can support teaching; learning and research work (Tiemo & Ateboh, 2016). Libraries are the nerve centre of an educational institution and a place where information is provided to serve all patrons irrespective of their ages, political and ethical background, religion, sex, etc. It could be seen that the role of higher institutions cannot be achieved without the presence of libraries that are adequately equipped with printed materials, information and communication technology and its related facilities, well trained staff and a high level of services to users that will satisfy their information needs.

Zeithaml and Bitner (2009) defined users' satisfaction as the means which users determine that a product or service meet their required needs and expectations. If the products or services do not meet their needs or expectations, it is therefore assumed that they are dissatisfied with the product or services. Similarly, Iwhiwhu and Okorodudu (2012) stated that users satisfaction with library information resources and services is a way in which users judge the adequacy of the library information resources and services rendered to them and also if their expectations are provided to them. Library user satisfaction implies how users feel after using the information resources and services and their willingness to return to the library when next they need information (Ikenwa & Adegbilero-Iwari, 2014). According to Ijiekhuamen, Aghojare and Ferdinand (2015) the level of using the library depends on users' satisfaction with the available information resources and services rendered to them. In a nutshell, users' satisfaction could be considered as the satisfaction users derive from the library by using the various types of information resources and services to fulfil their information needs for their various daily activities. Thus users' satisfaction can be better achieved through the use of Artificial Intelligence in Nigerian higher institutions' libraries.

Artificial Intelligence (AI) is the area of computer science focusing on creating machines that can engage on behaviours that humans consider intelligent. AI involves the following areas of researches: (1) expert system, (2) fuzzy logic, (3) artificial neural network, (4) evolutionary algorithms, (5) case base reasoning, (6) image processing,

(7) natural language processing, (8) speech recognition and (9) robotic. These areas are not separate and in many intelligent systems at the same time two or more AI techniques are contributed to solve problem. AI techniques or tools has utilized in many areas such business, management, medicine, military and etc. The ideas of utilization of intelligent system instead of classic system in libraries started from 1990. Intelligent library systems utilize AI technologies to provide knowledge-based services to library patrons and staff. AI is a broad complex area of study, which can be difficult for non-specialists to understand. Yet, its ultimate promise is to create computer systems that rival human intelligence, and this clearly has major implications for librarianship (Asemi, & Asemi, 2018). There are different AI applications in library system such as: descriptive cataloguing, technical services, and collection development; subject indexing, reference services, database searching, and document delivery. Some papers deal with the underlying design issues of knowledge representation and natural language processing. Many authors have previously provided in-depth overviews of AI technologies. There have also been several reviews of research and development efforts relevant to librarianship based on a review of major models of human intelligence. It is concluded that the following ten factors are most pertinent to Expert System (ES) research: acquisition, automation, comprehension, memory management, met control, numeric ability, reasoning, social competence, verbal perception, and visual perception which are associated with Library and Information Science (Asemi, et al, 2018). The application of artificial intelligence in the Nigerian academic libraries could lead to users' satisfaction.

1.2 Statement of the Problem

The higher institutions libraries are seen as the heart of the institutions that play major roles of accumulating, organizing, preserving and disseminating information resources to support teaching, learning and other research works to peoples of different ages, political, ethnicity, religion and gender within and outside the institutions. These are enormous tasks that require application of artificial intelligence to provide these services to give users' satisfaction. Therefore, this study investigates Artificial Intelligence in Libraries and Users Satisfaction in Higher Institutions in Nigeria.

1.3 Purpose of the Study

The purpose of this study is to investigate Artificial Intelligence in Libraries and Users Satisfaction in Higher Institutions in Nigeria. The study specifically sought to:

- 1) Determine the roles of Artificial Intelligence in the Libraries and the level of Users Satisfaction in Higher Institutions in Nigeria.

1.4 Research Question

The under stated research question was posed to guide this study

- 1) What are the roles of Artificial Intelligence in the Libraries and the level of Users Satisfaction in Higher Institutions in Nigeria?

1.5 Hypothesis

One null hypothesis was formulated and tested at 0.05 level of significance

- 1) There is no significant relationship between the roles of Artificial Intelligence in the Libraries and the level of Users Satisfaction in Higher Institutions in Nigeria.

2. REVIEW OF RELATED LITERATURES

2.1 Artificial Intelligence Areas that Can Be Adopted in Nigerian Higher Institutions Libraries

According to Asemi, et al, (2018) and Mogali, (2015) the following are the artificial intelligence areas that can be applied in libraries:

2.2 Applications of Expert Systems in Reference Service: Reference service is a prime activity of any library and the Expert System will work as a substitute for a reference librarian. The following are some of the examples of Expert Systems used for Reference Services.

- (a) Research: It is a system that supplies patrons, the recommended sources to lookup for certain question. The system can be used to teach students reference skills or as a computerized aid for practicing reference librarians and information specialists.
- (b) Pointer: It was the early successful working application of computer system in the area of reference work. It directs the users to the reference sources; it is not a Knowledge Based System but a computer assisted reference program.
- (c) Online Reference Assistance (ORA): This system intended to stimulate the services of an academic reference Librarian for questions of low and medium level, by using several technologies: a videotext like database, computer assisted instruction modules, and knowledge based system. ORA consist of directional transactions like library locations, services and polices.

(d) Answerman: A Knowledge based system help users for reference questions on agriculture topics. It uses series of menus to narrow down the subject of the questions and the type of tool needed. It can function as either a consultation system or as a front end to external databases and CD-ROM reference tools.

(e) PLEXUS: This is a referral tool used in Public Libraries. It includes knowledge about the reference process, information retrieval about certain subject areas, reference sources, and Library users. All the above systems are advisory systems for locating reference source books and factual data.

2.3 Application of Expert System in Cataloguing: Cataloguing is one of the oldest library crafts. Recent attempts to automate cataloguing through Expert Systems have focused on descriptive cataloguing because it is considered rule-based(AACR2).There are two approaches for applying artificial intelligence techniques to cataloguing

a) A human-machine interface, where the intellect effort is divided between the intermediary and the support system; and

b) An Expert System with full cataloguing capability linked into electronic publishing system, so that as a text is generated on-line, it can be passed through knowledge based systems and cataloguing process done without any intellectual input from an intermediary.

2.4 Application of Expert System in Classification: Classification is the fundamental activity in the organization of knowledge. For this reason, it is prominent in all systems for organizing knowledge in libraries and information centres. Application of Expert System in the area of classifications in libraries includes the following:

(a) Coal SORT: It is a conceptual browser designed to serve either as a search or an indexing tool. Coal SORT consists primarily of a frame-based semantic network and the software needed to allow users to display portions of it and to move around in the conceptual structure. The expert knowledge in the system is embodied almost entirely in the semantic network.

(b) EP-X: The Environmental Pollution Expert (EP-X) has certain things in common with coal SORT in that both are concentrating on enhancing interface using a Knowledge Based approach. The knowledge base of EP-X consists of hierarchical frame-based semantic network of concepts and a set of template that express the patterns called the pragmatic relationship among concepts. These patterns are referred to as conceptual information.

(c) BIOSIS: BIOSIS uses a knowledgebase, including a significant amount of procedural knowledge, to assign documents to categories automatically. It is designed as an indexer aid. BIOSIS uses the information in the titles of biological documents to assign as many categories as possible of those that would be assigned by human indexers. The indexing languages are structured and practical representation of information that can be used to very good advantage of AI applications.

2.5 Application of Expert System in Indexing: Indexing of periodicals is another area where expert systems are being developed. Indexing a periodical article involves identification of concepts, to translate these concepts into verbal descriptions, selecting and assigning controlled vocabulary terms that are conceptually equivalent to verbal descriptions. The reason for automating the intellectual aspects of indexing is to improve the indexing consistency and quality. Based on the information provided by the indexer, the systems can arrive at appropriate preferred terms automatically to assign relevant subdivisions. The system can make inferences and based on the inference, it can take appropriate action. 'Med Index' is the best example of indexing system used in the library Indexing activity. Very few library users have interacted with knowledge based systems. In general, users have had very little contact with these systems due to the fact that most of them are not perfect enough to be used by the everyday library patron.

2.6 Application of Expert System in Acquisition: The collection of documents is another integral part of the library. The librarian or the information officer is key person in this activity. The users of the library have a significant role to play in building electronic collections and that their help and advice should be solicited in the process. Several systems have been incorporated. Monograph Selection Advisor, a pioneering effort in applying this emerging technology in another area of Library Science i.e. building library collection. Specifically, the task modelled is the item-by-item decision that a subject bibliographer makes in selecting monographic. The knowledge base has to be broad enough and the interfacing aspect must be easy enough for the library to get the desired information from the machine.

2.7 Applications of Natural Language Processing in Library Activities: When we think of the term NPL, the first thought one might have is of being able to speak or write in a complete sentence and have a machine process the request and speak. NPL can be applied to many disciplines. To apply this to the field of Library

and Information science and more specifically to searching database such as online public access catalogues (OPAC). Indexing is the basis for document retrieval. "The aim of indexing is to increase precision, the portion of the retrieved documents that are relevant; and recall, the proportion of relevant documents that are retrieved"

2.5 Application of Pattern Recognition in Library Activities: In this era of the Internet and distributed, multimedia computing, new and emerging classes of information systems applications have swept into the lives of office workers and everyday people. New applications ranging from digital libraries, multimedia systems, geographic information systems, and collaborative computing to electronic commerce have created tremendous opportunities for information researchers and practitioners

2.9 Applications of Robotics in the Library Activities: Robot is "an automatically controlled, re-programmable, multi-purpose manipulator programmable in three or more axes, which may be either fixed in place or mobile for use in automation applications." The robots are on scrambling, rolling, flying, and climbing. They are figuring out how to get here on their own. As 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, especially academic research libraries. The goal of the Comprehensive Access to Printed Material (CAPM) is to build a robotic, on-demand and batch scanning system that will allow for real-time browsing of printed material through a web interface. The user will engage the CAPM system that, in turn, will initiate a robot that will retrieve the requested item. The robot will deliver this item to another robotic system that will open the item and turn the pages automatically. By using existing scanners, optical character recognition (OCR) software, and indexing software developed by the Digital Knowledge Centre, the CAPM system will not only allow for browsing of images of text, but also for searching and analysing of full-text generated from the images.

2.10 Advantages of Artificial Intelligence

- a) Can take on stressful and complex work that humans may struggle /cannot do
- b) Complete task faster than a human being can
- c) To discover unexplored things i.e. outer space;
- d) Less errors and defects;
- e) Can assist in accessing research jobs in any part of the world with ease
- f) Function is infinite (Mogali, 2015)

2.11 Disadvantages of Artificial Intelligence

- a) Lacks the "human touch"
- b) Has the ability to replace human jobs
- c) Can malfunction and do the opposite of what they are programmed to do
- d) Can be misused leading to mass scale destruction
- e) May corrupt younger generation (Mogali, 2015).

3. METHODOLOGY

The study adopted a correlational research design to find out the relationship between Artificial Intelligence in Libraries and Users Satisfaction in Higher Institutions in Nigeria. The study covered University of Uyo (UNIUYO) with Department of Business Education and Mass Communication, University of Calabar (UNICAL) with Department of Sociology and English and Literary Studies, Rivers State University (RSU) with Departments of (Business Education and Mass Communication), Ignatius Ajuru University of Education (IAUE) with Departments of (Political Science and Biology), University of Port Harcourt with Departments of (Computer Science and Sociology) , National Open University with the Department of Law and Mathematics, Captain Elechi Amadi Polytechnic with the Departments of Office Technology & Management and Science & Laboratories Technology (SLT) . 300 Lecturers and 3,200 students from twelve Departments of the six universities and polytechnics were carefully selected to form the population of 3,500 ranging from Years 1, 2, 3 and 4, National Diploma I, II and Higher National Diploma I and II. The lecturers range from the categories of Graduate assistants to Professors. A random sampling technique was adopted. Krejcie and Morgan (1970) method used in determining the sample size of a known population was used to determine the sample size of 346. The instrument used was tagged "Artificial Intelligence in Libraries and Users Satisfaction in Public Higher Institutions in Nigeria" (AILUS), with a four point scale of Very High Level of Role (VHLR; 4 Points), High Level of Role (HLR; 3 Points), Moderate Level of Role (MLR; 2 Points) and Very Low Level of Role (VLLR; 1 Point). The instrument was validated by three experts and a

field trial of test retest was done to know the internal consistency which yielded 0.89 co-efficient. 346 copies of questionnaire items were face-to-face administered to the respondents and 250 successfully retrieved. Arithmetic mean was used to analyse the research question, and Standard Deviation used to find out the extent in which scores in the distribution clustered around the means. Pearson Product Moment Correlation (r) was adopted to test the only hypothesis.

The decision point was that any calculated grand mean from 2.5 and above was accepted and any grand mean below 2.5 was rejected. Also, any calculated value of (r) that was greater than > the critical table value of 0.113 at 0.05 significant levels; such null hypothesis (H₀) will be rejected and vice versa.

4. RESULTS

Research Question 1: What are the roles of Artificial Intelligence in the Libraries and the level of Users Satisfaction in Higher Institutions in Nigeria?

Table 1: Computation of Mean and Standard Deviation on the Roles of Artificial Intelligence in the Libraries and the level of Users Satisfaction in Higher Institutions in Nigeria

SN	N = 250, TNR = Total Number of Response									
	Items statements	VHLR 4	HLR 3	MLR 2	VLLR 1	TNR	X	SD	Remarks	
1	Applications of Expert Systems in Reference Service:	150(600)	100(300)	0(0)	0(0)	900	3.6	0.9	HLR	
2	Application of Expert System in Cataloguing	100(400)	100(300)	50(100)	0(0)	800	3.2	0.8	HLR	
3	Application of Expert System in Classification	170(680)	80(240)	0(0)	0(0)	920	3.7	0.9	HLR	
4	Application of Expert System in Indexing	180(720)	70(210)	0(0)	0(0)	930	3.7	0.9	HLR	
5	Application of Expert System in Acquisition	160(640)	90(270)	0(0)	0(0)	910	3.6	0.9	HLR	
6	Applications of Natural Language Processing in Library Activities	190(760)	60(180)	0(0)	0(0)	940	3.8	0.9	HLR	
7	Application of Pattern Recognition in Library Activities	200(800)	50(150)	0(0)	0(0)	950	3.8	0.9	HLR	
8	Applications of Robotics in the Library Activities	160(640)	90(270)	0(0)	0(0)	910	3.6	0.9	HLR	
Grand mean/SD							3.6	0.9	HLR	

Researcher's Field Survey 2018

The grand mean and grand standard deviation on Table 1 showed 3.6 and 0.9, respectively indicating that there was high level of roles played by artificial intelligence in libraries in higher institutions in Nigeria and closeness in the views of the respondents. This means that artificial intelligence played a high level of roles in the delivery of libraries goods and services to the users in higher institutions in Nigeria.

Table 2: Computation of Mean and Standard Deviation of Level of Satisfaction on the Artificial Intelligence in the Libraries and the level of Users Satisfaction in Higher Institutions in Nigeria (Correlational Table)

SN	N = 250, TNR = Total Number of Response									
	Items statements	VHLS 4	HLS 3	MLS 2	VLLS 1	TNR	X	SD	Remarks	
1	Applications of Expert Systems in Reference Service:	150(600)	100(300)	0(0)	0(0)	900	3.6	0.9	HLS	
2	Application of Expert System in Cataloguing	200(800)	50(150)	0(0)	0(0)	950	3.8	0.9	HLS	
3	Application of Expert System in Classification	200(800)	50(150)	0(0)	0(0)	950	3.8	0.9	HLS	
4	Application of Expert System in Indexing	160(640)	90(270)	0(0)	0(0)	910	3.6	0.9	HLS	
5	Application of Expert System in Acquisition	150(600)	100(300)	0(0)	0(0)	900	3.6	0.9	HLS	
6	Applications of Natural Language Processing in Library Activities	100(400)	100(300)	50(100)	0(0)	800	3.2	0.8	HLS	
7	Application of Pattern Recognition in Library Activities	170(680)	80(240)	0(0)	0(0)	920	3.7	0.9	HLS	
8	Applications of Robotics in the Library Activities	180(720)	70(210)	0(0)	0(0)	930	3.7	0.9	HLS	
Grand Mean/SD							3.6	0.9	HLS	

Researcher’s Field Survey 2018

The grand mean and grand standard deviation for level of satisfaction showed 3.6 and 0.9 respectively too. This means that application of artificial intelligence in the public libraries in higher institution in Nigeria showed high level of satisfaction.

Table 3: Summary Table of the Roles of Artificial Intelligence in the Libraries and the level of Users’ Satisfaction in Higher Institutions in Nigeria

SN	Variables	Number	Grand mean	SD	Remark
1	Roles of Artificial Intelligence	250	3.6	0.9	HLR
2	Level of Users Satisfaction	250	3.6	0.9	HLS

Researcher’s Field Survey 2018

The summary (table 3) of tables 1 and 2 showed that artificial intelligence has high level of roles in delivering libraries’ goods and services and users will have high level of satisfaction in the application of artificial intelligence in the libraries in higher institutions in Nigeria.

Table 4: (r) Computation of the Relationship between the Roles of Artificial Intelligence in the Libraries and the Level of Users’ Satisfaction in Higher Institutions in Nigeria

Variable	N	X	SD	Df	Alpha level	r-cal.	r-crit.	Remark	Decision
1 Roles of Artificial Intelligence	250	3.6	0.9						
				248	0.05	1.321	0.113	Significant	Rejected
2 Level of Users Satisfaction	250	3.6	0.9						

Researcher’s Field Survey 2018

The result in table 4 revealed that the (r) calculated value is greater than r-critical value. Since the r-calculated value of 1.321 is greater than the r-critical value of 0.113, therefore, the null hypothesis which stated there is no significant relationship between the Roles of Artificial Intelligence in the Libraries and the level of Users Satisfaction in Higher Institutions in Nigeria is rejected. This means that there is significant relationship between the Roles of Artificial Intelligence in the Libraries and the level of Users Satisfaction in Higher Institutions in Nigeria.

5. DISCUSSION OF THE FINDINGS

From the analysis of research question 1, the findings showed that there was high level of roles played by artificial intelligence in delivering libraries’ services in higher institutions in Nigeria. The opinions of the respondents are in agreement with Asemi, et al (2018) and Mogali (2015) who saw Applications of Expert Systems in Reference Service, Application of Expert System in Cataloguing, Application of Expert System in Classification, Application of Expert System in Indexing, Application of Expert System in Acquisition, Applications of Natural Language Processing in Library Activities, Application of Pattern Recognition in Library Activities and Applications of Robotics in the Library Activities as high level of roles played by artificial intelligence in libraries in higher institutions in Nigeria.

6. CONCLUSION

Based on the findings of this study, it is concluded that there was high level of roles played by artificial intelligence in the delivering of libraries services and high level of satisfaction from the use of artificial intelligence in the public libraries of higher institutions of Nigeria.

7. RECOMMENDATIONS

- a) Higher institutions libraries should intensify efforts in adopting artificial intelligence in the delivery of libraries services for libraries users to gain very high level satisfaction.
- b) Government and concerned agencies should provide adequate artificial intelligent hardware and software to aid in the delivery of libraries services to users.
- c) Library staff should be exposed to training and retraining in the use of artificial intelligence in delivering of libraries services so that users can gain very high level of satisfaction.

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