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RESEARCH ARTICLE

Situation Awareness of Artificial Intelligence Technologies among Librarians in Edo and Delta States, Nigeria

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Abstract
The use of Artificial intelligence technologies is gaining momentum across all sectors including librarianship. Investigation into factors that predict adoption among librarians is crucial in enhancing adoption. Consequently, this study applied situation awareness theoretical model to examine awareness of AI among a certain group of academic librarian in Nigeria. Descriptive survey research design was adopted. The population consist of 125 librarians selected from 18 Universities in Edo and Delta State, Nigeria. A total of 107 librarians filled the questionnaire and total enumeration technique was adopted because of the manageable size of the population. Findings revealed that the respondents have high level of situation awareness with regards to perception, comprehension and projection of AI technologies. The results also show that librarians are aware of AI technologies and its functionality for information discovery, access and other information service functions. The study concludes with recommendations.

Keywords: Artificial Intelligence Technologies; Situation Awareness; Academic Librarians; Library services; Nigeria

Introduction

The willingness of librarians to use any technological innovation is determined by a lot of factors, one of which is the level of awareness (Arowosola, Onyenania, &George, 2021; Dukper, Sakibu, &Arthur, 2018). Other factors may include perceive usefulness and perceive ease of use (Okuonghae & Tunmibi, 2024). Librarians as information professionals are known for their ability to leverage innovative solutions to meet the evolving information needs of their diverse users. Artificial Intelligence is undoubtedly one of such technologies that could improve information services in the library because of its transformative potentials. As usual, most literature from the global south focuses on highlighting the potentials of AI within the library landscape. Bello & Abdulsalam (2023) surveyed literature on the use of AI in the library space and found out that AI can improve library

services like circulation and reference services, book shelving and shelf reading, cataloguing of library materials, information search and interpretation. The fact that AI could be applied to improve library services is well established in most climes (Adejo & Misau 2021). However, the extent of its application in Nigeria is not clear. However, Echedom and Okuonghae, (2021) assert that University of Lagos (UNILAG) is the sole institution in Nigeria to have integrated AI into library services and operation. UNILAG in 2020 acquired a humanoid robot for the library operation. Meanwhile, earlier in 2019 the University of Pretoria (UP), South Africa acquired a client service robot for similar operations. These scholars conclude that these are the only libraries in sub-Sahara Africa that have adopted AI. This narrative was affirmed by Moustapha and Yusuf (2023) that only UNILAG library has incorporated AI to its operation and services in Nigeria. They also opined that the level of awareness among library professionals about the use of AI for library services and process is low. However, this study is not about libraries but librarians themselves. The above submission failed to take into account the fact that there are different kinds of AI technologies available for librarians to use and the humanoid acquired by the UNILAG is merely one of such. Essentially, AI may take the form of robots as in the case of UNILAG and UP, or machine, computer programs, applications or software. For instance, Google assistant which was reported in a recent study to be the most commonly used AI tools among librarians in Nigeria is used to enhance search process on digital or android devices. It leverage AI technology to facilitate two way conversation using Google natural language processing algorithm (Tunmibi & Okuonghae, 2023). Other similar software is Chat Generative Pre-Trained Transformer (ChatGPT) which is being used by librarians for reference and general information discovery. The obvious confusion as to the level of awareness and nature of AI among librarians could be resolve when situation awareness is applied to understand librarians' actual awareness of artificial intelligence technologies. Situation awareness (SA) refer to the capacity to perceive, comprehend and interpret necessary information about a particular situation in order to make effective decisions and take appropriate actions. Situation awareness is a multidimensional concept applicable to different field and professions. Endsley (2023) defined situation awareness as the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the future. The definition offered by Endsley is broken into a three-level theoretical framework. The framework is divided into three cognitive levels starting with level 1, level 2 and level 3. The model which shows dynamic interaction between humans and their environment follows a sequential process. These three levels represent the key components of situation awareness that is, perception (being able to detect and observe relevant information), comprehension (understanding the meaning of that information), and projection (predicting what might happen in the future). Level 1 in this regard involves the knowledge of the AI technologies as tools for librarians. Level 2, entails the level of information available to librarians about the use of artificial intelligence technologies, particularly when integrated in relation to professional and personal goals. In other words, comprehension entails having a clear purpose for integrating AI to improve work performance within the library ecosystem. Level 3 of this cognitive process entails knowledge of the future prospect of AI technologies. At the level, the librarian is able to appreciate what will happen with AI as a novel technology. Again, this may involve taking precautions to prevent negative effect of lagging in the adoption of AI

technologies or the consequences an individual or group of people may face for using AI technologies. Such consequences may include loss of job for librarians. The use of these technologies is critically determined by awareness of the users, in this case, librarians. In this regards, this paper attempt to examine situation awareness of artificial intelligence technologies in the field of librarianship. Studies have shown that the use of AI within the library space is limited. Thus, this study aims to investigate the influence of situation awareness on use artificial intelligence technologies among librarians in Edo and Delta States, Nigeria. This study provide answer to one research question: What is the level of situation awareness among librarians in Edo and Delta States, Nigeria? The remainder of this work is structured as follows: literature review, methodology, results and discussion and conclusion.

Literature Review

The concept of artificial intelligence consists of two related sub concepts: artificial and intelligence. The first, artificial denotes something that happen or occur by human or machine rather than nature (Federico, 2020). The second concept, intelligence refers to the ability to acquire knowledge, apply reasoning, adapt to new situations, and solve problem effectively. Prior to advancement in deep learning, neutral networks and computational models, intelligence was the exclusive preserve of humans and animals. However, with the advent of artificial intelligence, machines and systems now possess human like cognitive abilities. These machines and systems process huge volumes of data, identify patterns, make decisions, and even learn from their experience (Karn et al., 2022). Librarians are known to employ technology in libraries and for their personal and professional activities. In fact, Eneh and Idiodi (2024) highlighted the role of librarians' awareness in the integration of AI technologies for information provision. Consequently, Tunmibi and Okuonghae (2023) survey the use of artificial intelligent technologies among librarians and found that Google Assistant and ChatGPT were among the top AI tools being employed by librarian in Nigeria. Within the library space, Echedom and Okuonghae, (2021) found that the only institution that have applied robotics AI for library services is the UNILAG library. Moustapha and Yusuf (2023) corroborated this finding. Studies have been made on awareness of AI technologies among librarians in Nigeria. Literature indicates that the findings are conflicting. Moustapha and Yusuf (2023) claims that the level of awareness among library professionals about the use of AI for library services and process is low. In addition, Lulu-Pokubo and Okwu (2024) investigated librarians' awareness towards the use of artificial intelligence technologies for sustainable library services. The finding revealed that there is high extent of the level of librarian's awareness in the use of AI technologies in library services. Eiriemiokhale and Sulyman, (2023) while measuring the awareness of artificial intelligence among librarians in University Libraries in Kwara State, posed the four question to determine awareness: 'I am aware of dynamed'; 'I am aware of micromedex'; 'I am aware of expert system', 'I am aware of virtual references'; 'I am aware of Chatbots' to which the respondents were to answer 'yes' or 'no'. The finding revealed that chatbots among others were known to the respondents. In a related study, Isiaka et al. (2024) surveyed perceived awareness and usefulness of artificial intelligence technology for efficient library operations in university librarians in Kwara State. The study was on four point

likert scale using 'highly aware', 'aware' 'rarely aware' and 'not aware' as keys to answer the statements "aware of robot", "aware of chatbots", "aware of humanoid" "aware of dynamed", "aware of AI expert system", and "aware of virtual references". Data collected revealed that respondents were highly aware of AI robots, AI chatbot, humanoid and expert systems among others.

Oyekale, and Zubairu (2023) in assessing awareness level of artificial intelligence among librarians in university libraries in Osun State, adopted a rather simple approach of stating 'yes', 'I don't know' and 'no' to determine awareness respondents level of awareness. It was discovered that 80% of the respondents considered themselves to be aware of artificial intelligence. In attempt to make a distinction between statutory librarian and other librarian, Sambo and Oyovw-Tinuoye (2023) investigated awareness and perception of certified librarians of Nigeria towards the use of robotic technologies in the library. Study measured awareness with three indicators asking the respondents to respond to the following 'high level of awareness', 'average level of awareness' and 'low level of awareness'. From the study, it was shown that certified librarians are averagely aware of the existence of robotic technology for library service delivery. As shown above, the methods and techniques applied in these studies are not sufficient or adequate enough to ascertain the level of awareness of AI technologies among librarians. To close this gap, Endlsley (2023)'s three level theoretical framework which involves perception, comprehension and projection is deemed appropriate. Conceptually, situation awareness is the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and projection of their status in the near future (Endsley, 2015). Situation awareness is an improvement on the concept of awareness. It is about how well subjects understand their environment. It was originally devised to ensure safety in military and aviation operations. Feller et al. (2023) in their study indicate that situation awareness is very relevant in the area of health care. The theory has also been applied in areas where information and past experience to make decision about acceptance or rejection of an idea or technology (Qazi et al., 2020). Generally, awareness is having knowledge about something or knowing that something exists. But the comprehension and the cognitive prediction of future represented in Endsley's theoretical framework makes both concepts remarkably different. The essence of such situational knowledge is to enable the targeted users (Librarians) make active decision to use AI. This implies that if there is no proper awareness of AI technologies the extent of librarians' knowledge cannot be determined, and librarians may not be fully aware of its usefulness. Again, they may even use them without knowing. Lenart (2023) posits that some academic librarian may say they lack knowledge of AI, yet they have been interacting with AI through different software applications. Popular in this category are chatbots, often called "virtual assistant" which enhances browsing experience in the digital domain. In other words, situational awareness plays a crucial role in motivating librarians to embrace artificial intelligence technologies.

Methodology

The descriptive research survey methods were adopted for this study. The population for the study consists of all librarians with a minimum of Bachelor degree in Library and Information Science from

public and private universities in Edo and Delta states. According to the National Universities Commission at the time of the study, there are eight universities in Edo State. They include: University of Benin, Benin City; Ambrose Alli University, Ekpoma; Edo University, Uzairrue; Benson Idahosa University, Benin City; Igninedion University, Okada; Glorious Vision university, Ogwa; Well Spring University, Evbuobanosa; Mudiamen University, Irrua. Meanwhile, Delta state had nine universities; Federal Univeristy of Petroleum resources, Effurun; Admilralty University, Ibusa; Nigerian Maritime University, Okerenkoko; Delta State University, Abraka; Edwin Clark University, Kaigbodo; Michael and Cecilia Ibru University, Agbara-Otor; Western Delta University, Oghara; Dennis Osadebey University, Magaret Lawrence University, Umunede and Sport University of Nigeria, Idumuje-Ugboko.The instrument used for data collection was a self-developed structured questionnaire. The questionnaire was divided into two sections (section A and B). Section A focused on the respondents' bio-data, while Section B elicited data on the level of situation awareness of artificial technologies among librarians. The section was measured on a four-point likert scale of "Very High Extent (VHE)", "High Extent (HE)", "Low Extent (LE)" and "Very Low Extent (VLE)". To ensure the validity of the instrument, a copy of the questionnaire was given to two experts in the field of Library and Information Science. Their comments and suggestions were used to draft the final copy of the instrument. Furthermore, the reliability of the instrument was ascertained using the Cronbach Alpha method. A reliability coefficient of 0.78 (for situation awareness) is within the accepted range for reliability of research instruments. The final copy of questionnaire was converted to online survey using Google Forms. The link to the survey was sent to the respondents via Whatsapp, while some were physically administered. To ensure maximum participation, reminder notices were sent at intervals and the survey collected data for a period of four weeks. At the end of the data collection period, a total of 107 valid responses were received and used in the study. The collected data were analysed using descriptive and inferential statistics and with the aid of the Statistical Package for the Social Sciences (SPSS) version 28.The benchmark for data analysis is 2.5

Results and Discussion

The results presented were based on the sole research questions which the study set out to answer and understudy. The Decision rule: 1.0.-1.49 = very low, 1.50-2.49 – low, 2.50 -3.49 = High, 3.50-4.00 = Very high.

Table 1 above shows the demographic distribution of the respondents. The table revealed majority of the respondents, 61 making 57% of the population, are female while the remaining, 46 making 43%, are males. The largest age group is "18-30," which comprises 40.2% of the total. The "31-40" and "41-50" age groups are also well-represented, with 28% and 29% respectively. The 61 and above age group has the smallest proportion at 2.8%. This suggests a relatively young to middle-aged population. The implication of this is that majority of the librarians who participated in the study are within the range of 31-50 years.

Table 1: Gender and Age of the Respondents

Demographics	Items	Frequency	Percent
GENDER	MALE	46	43.0
	FEMALE	61	57.0
TOTAL		107	100.0
AGE			
18-30		43	40.2
31-40		30	28.0
41-50		31	29.0
61 AND ABOVE		3	2.8
TOTAL		107	100.0

Table 2: Staff Cadre and Educational Qualifications of Respondents

Staff Cadre			
	ASST. LIBRARIAN	49	45.8
	LIBRARIAN II	12	11.2
	LIBRARIAN I	23	21.5
SENIOR LIBRARIAN		10	9.3
PRINCIPAL LIBRARIAN		4	3.7
DEPUTY UNIVERSITY LIBRARIAN		1	.9
UNIVERSITY LIBRARIAN		8	7.5
TOTAL		107	100.0
EDUCATIONAL QUALIFICATIONS			
B.SC/BLIS		67	62.6
MSC/MLIS		29	27.1
	PHD.	11	10.3
	M.PHIL	Nill	
	TOTAL	107	100.0

As shown in Table 2, Asst. Librarian" is the most common staff cadre, accounting for 45.8% of the total. Other staff cadres like "Librarian II", "Librarian I," and "Senior Librarian" accounting for 11.2%, 21. 5% and 9.3% respectively also have significant representation. Principal librarians make 3.7% of the population; deputy university librarians make 0.9% and university librarian making 7.5% of the population. The implication of this is that Asst. Librarian, Librarian II and Librarian I, representing a total of 81.5%, are the dominant cadres among the participating institutions. Looking at the education qualifications, "B.Sc./BLIS" is the most common qualification, with 62.6% of respondents holding this degree followed by "MSc/MLIS" with 27.1%. A smaller percentage, 10.3%,

holds a "PhD" qualification. There are no respondents with "M.Phil." qualification in the study population.

Research Question 1: What is the level of situation awareness among librarians in Edo and Delta States, Nigeria?

Table 3: Rating of librarian's situation of awareness regarding artificial intelligence technologies

Items	Very High Extent	High Extent	Low Extent	Very Low Extent	Mean
Perception					
I have heard about artificial intelligence technologies	19 (17.8%)	31 (29.0%)	44 (41.1%)	13 (12.1%)	3.54
I have come across artificial intelligence technologies and know quite a bit about it	34 (31.8%)	38 (35.5%)	32 (29.9%)	3 (2.8%)	3.02
I have come across artificial intelligence technologies but know just a little about it	31 (29.0%)	50 (46.7%)	23 (21.5%)	3 (2.8%)	2.72
I have heard about artificial intelligence but know nothing about it	19 (17.8%)	49 (45.8%)	29 (27.1%)	10 (9.3%)	2.52
Weighted Mean					2.95
Comprehension					
I am aware of what artificial intelligence technologies are used for	41 (38.3%)	54 (50.5%)	12 (11.2%)		3.27
I am aware of the nature of artificial intelligence technologies	28 (26.2%)	50 (46.7%)	26 (11.2%)	3 (2.8%)	3.16

I am aware of how to use artificial intelligence technologies	28 (26.2%)	50 (46.7%)	26 (24.3%)	3 (2.8%)	2.96
I am aware of the danger and opportunity of using artificial technologies	34 (31.8%)	38 (35.5%)	32 (29.9%)	3 (2.8%)	2.96
Weighted Mean					3.1
Projection					
Using artificial intelligence technologies can boost the speed of carrying out my job	55 (51.4%)	448 (44.9%)	4 (3.7%)		3.48
Using artificial intelligence would allow me to be more useful to myself, employer and users	53 (49.5%)	49 (45.8%)	5 (4.7%)		3.45
Using artificial intelligence enhance my prestige as a modern librarian	52 (51.4%)	52 (44.9%)	2 (1.9%)	1 (.9%)	3.45
I would find artificial intelligence useful in my career	51 (47.7%)	52 (48.6%)	4 (3.7%)		3.44
Weighted Mean					3.5
Grand Mean					3.2

The Decision rule: 1.0-1.49 = very low, 1.50-2.49 – low, 2.50 -3.49 = High, 3.50-4.00 = Very high.

Data in table 3 indicated that librarians have varied degree of situation awareness. Their perception of AI is between 2.52 to 3.54; their comprehension stood at 2.96 to 3.27, their projection of AI was the highest with a mean range of 3.44 to 3.48. The Grand Mean for all items is 3.2, indicating an overall high level of situation awareness with regards to perception, comprehension, and projection of AI technologies among respondents. The respondents generally have a positive perception of AI, as well as high level of comprehension and projection, with most of the respondents believing it would be useful for their careers and can enhance their prestige and job performance. However, there is a significant range of knowledge about AI, with some respondents having limited knowledge and others having a high level of knowledge. It can therefore be implied that librarian are aware of AI technologies and its functionality for information discovery, access and other service functions.

Discussion

The study aimed at examining situation awareness of AI technologies among librarians. The result revealed that respondents have positive perception as well as high level of comprehension and projection of AI technologies, with most respondent believing it would be useful for their career and could enhance their prestige and job performance. However, the significant range of knowledge about AI among respondents may be attributed to the fact that majority of the respondent are relatively young to middle-aged population falling within 18-30years and may have been exposed to such technology in their academic pursuit. This is in line with Okuonghae, Igbinovia and Adebayo (2022) that modern LIS curriculum expose the student to novel technological innovation transforming library operations. The high level of awareness of AI among librarians could also be attributed to the nature of AI technology improving user experience, streamline operations, and enhancing information discovery. This is in tandem with Okuonghae and Tunmibi (2024) who assert that perceived ease of use and perceived usefulness are two cardinal motivations in AI adoption among librarians.

Conclusion and Recommendations

AI technologies enhance information access and smart service delivery. The adoption of these technologies enables automation of most library services. From the global south, 'awareness' have been highlighted as a major factor that influences AI adoption among librarians. In determining the level of AI 'awareness' among librarians, this study employed a robust approach in measuring 'awareness' through the use of situation awareness theoretical framework measuring perception, comprehension and projection. The three component of 'awareness' allowed respondents to indicate whether 'they have heard about AI', 'know what they are used for', 'whether they have used it' 'aware of the danger and opportunities of using AI' and 'whether they find it useful in their career'. The conclusion is that there is high level of situation awareness with regards to perception, comprehension and projection of AI technologies. This solidifies previous studies indicating high level of awareness of AI technologies among librarians.

Based on the finding and conclusion reached in this study, the following recommendations are considered applicable;

i. The study shows that the majority of librarians has positive perception of AI technologies and comprehend the nature, usefulness, challenges and opportunities of AI. Therefore, it is recommended that the Head of libraries promote the use of AI among staff to enhance their productivity and facilitate seamless library operations

ii. The study also shows that majority of librarians had high level of projection in the use of AI. Consequently, Head of Libraries should encourage their staff to use AI to boost their prestige, carry out their job as well as advance their career as modern librarian.

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