Information Searching Skills and Use of Digital Library Resources for Learning Among Undergraduate Students of Universities in Yobe State, Nigeria

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Abstract
The paper investigated information searching skills and use of digital library resources for learning among undergraduate students of universities in Yobe State, Nigeria. The 14,141 undergraduate students enrolled in the universities made up the study's targeted group. Using a proportionate stratified random sampling procedure, 384 respondents were included in the sample. A questionnaire was employed as the primary data collection tool, and both descriptive and inferential statistics were used to analyse the results. The findings of the study revealed that despite having some informal Internet skills, the research subjects' information searching skills were found to be inadequate. The results of the study showed that the respondents lacked formal information searching skills and strategic Internet skills. Furthermore, the results showed that the only digital library resources being used were e-journals, e-books, e-newspapers, and online dictionaries. Other crucial resources, such as e-databases, e-projects, e-theses, and e-dissertations, were not being used to their best advantage. Consequently, the study suggested that the management of libraries should implement digital literacy initiatives and teach students about the value of utilising a variety of digital resources found in libraries to support their learning objectives. In a similar vein, the managements ought to create workshops and training courses for students in digital literacy. Basically, the priorities should be raising awareness and providing tutorials and primers.

Keywords: Information Searching Skills, Use, Digital Library Resources, Undergraduate

Introduction

The previous few decades have seen an incredible digital revolution take place in the world. Human lives are impacted by technology in a variety of ways. Both libraries and library users are impacted by this. The digitisation of books, the growth of academic databases, the expansion of online reference resources and services, and the automation of libraries are only a few significant areas where the digital transformation of libraries is having an impact. Many digital library resources (DLRs) are being used for teaching and learning purposes as a result of the digital transformation. The benefits of remote access, ease of manipulation, and

convenience drive this utilisation. On the other hand, in order to utilise the resources of the digital library, a few specific abilities are needed, such as proficiency with computers, synthesis, assessment and utilisation, and information searching skills (henceforth, ISS) (Khoo, 2019).

Cerretani, Iturriozm, and Garay (2016) defined information searching skills as all the actions taken in the process of determining the information that is required from a variety of information sources and assessing the resources to meet the information need. Similarly, Adeleke and Emeahara (2016) noted that in the twenty-first century, one's ability to effectively access and utilise pertinent digital information resources is primarily determined by their proficiency with various ISS strategies. Okocha and Owolabi (2020) have pointed out that a person's research requirements increase in complexity when they become an ISS member. It makes sense that ISS is more complicated than simply typing a term into a search engine or library database to obtain all the necessary information resources. Therefore, it is essential that people learn the skills necessary to investigate the ever-growing pool of knowledge. Consequently, mastering ISS will enable undergraduate students to find and make use of pertinent digital library resources including databases and search engines.

The advantages and needs of ISS for undergraduate students have long been recognised by numerous academics. For instance, Job and Nwokedi (2020) claimed that to satiate their informational thirst, students want ISS in order to explore computer-based systems like the OPAC and the World Wide Web. Furthermore, Khoo (2019) stated that ISS is a benchmark for achieving both professional and personal growth since it measures the amount of knowledge that undergraduate students have learnt during their studies. Furthermore, Yebowaah and Plockey (2017) noted that undergraduate students would rather browse and use the internet resources for their information needs than go to the library and conduct manual searches for information. Libraries no longer only keep printed materials like books, periodicals, and journals in their repositories; they now have access to online resources and other DLRs.

Research on the Information Searching Skills (ISS) and undergraduate students' usage of DLRs has become widespread. According to some of these studies (Okocha and Owolabi, 2020; Thindwa, Chawingra & Dube, 2019; Scoulas & De Groote, 2019; Reddy, Krishnamurthy & Asundi, 2018; Mizrachi, Boustany, Kurbanoğlu & Doğan, 2016; Kadli & Hanchinal, 2015), undergraduate students' access to and use of DLRs has been hindered due to subpar and partially non-effective ISS. However, some academics have argued that in order to fully comprehend the problems related to the ISS and the usage of DLRs, more thorough study and studies are necessary (Gkorezis, Kostagiolas & Niakas, 2017). Furthermore, El-Maamiry (2017) contended that the need for broader research stems from the fact that ISS differs throughout disciplines.

Considering the aforementioned situations, additional research is still needed to comprehend ISS dynamics and undergraduate students' use of DLRs in various contexts. Thus, this study examined undergraduate students' usage of digital library resources for learning and their information-searching skills in universities

in Yobe State, Nigeria. Federal University Gashua and Yobe State University Damaturu were these universities.

The Yobe State University Damaturu was founded in 2006. It is located in Damaturu town, the capital of Yobe State. The university currently has a population of 9,843 undergraduate students spread in five faculties. The university library has a setting capacity for 400 users at a time. The digital section of the library has 250 computers and makes available electronic databases to users that included EBSCOhost, Science Direct, E-granary, Alexandria, and other offline databases. The Federal University Gashua was established in 2013. The university presently has a population of 4,300 undergraduate students. The university has 5 faculties and 23 undergraduate programmers. The university library has a setting capacity for 300-500 readers at a time. The digital section of the library is equipped with about 100 computers. The digital library makes available subscribed databases to users. These databases include J-stor, Caliber, Ebscohost, and Science Direct.

Problem Setting

Technology advancements have increased the value of digital library resources. Students, scholars, and other information searchers can now access and utilise library resources remotely thanks to technological advancements. Like many other university libraries throughout the world, university libraries in Yobe State have been heavily investing in DLRs acquisition and purchase as well as upkeep of online database subscriptions to enhance the educational process. In a similar vein, the institutions are running several initiatives to promote undergraduate students' usage of digital library resources and to assist their learning. These programs include computer literacy assistance, orientation activities, library instructions, and user education.

However, data records and firsthand observation have shown that there is little DLRs usage among undergraduate students in the study area, even though the two universities under investigation had DLRs and ISS programs available. As a result, this investigation posed the following question: What relationship exists between undergraduate students' utilisation of digital library resources for learning in Yobe State, Nigerian universities and their information searching skills? However, prior studies conducted globally have recognised that undergraduate students generally have low ISS, which inevitably affects their capacity to utilise digital library resources. Nevertheless, previous researches have not included universities in Yobe State, thus nothing is known about undergraduate students' opinions of ISS and DLRs use. Therefore, this study is embarked to fill this knowledge gap.

Research Objectives

The study is set:

1. To examine the current digital library resources use for learning by undergraduate students in universities in Yobe State.
2. To determine the information searching skills use for learning by undergraduate students in universities in Yobe State.

Research Hypotheses

$H0_1$: There is no significant relationship between information searching skills and use of digital library resources for learning by undergraduate students in universities in Yobe State.

Literature Review

Digital Library Resources Use for Learning by Undergraduate Students

Digital information resources that must be accessed via a computer or other electronic device that offers a collection of data—whether in full-text, databases, e-journals, picture collections, multimedia and media-based products, OPAC, and other computer networks—are commonly referred to as digital library resources (Ramzan, Asif, & Ahamad, 2021; Saklani, 2020; Sreekumar, 2020; Kwafoa, Anhwee & Manu, 2019). Information in a format that can be accessed using a computer or other device that requires an Internet connection is often the definition of digital library resources (Anyim, 2018). According to Sejane (2017), portals, news, and other media sources, along with visual assets, make up digital library resources. Additionally, digital libraries, virtual libraries, open access repositories, federated search, virtual reference, and digital institutional repositories are significant types of digital information resources (Jonathan & Udo, 2015).

Research in the field of information science has demonstrated that undergraduate students at universities use a variety of digital library resources for educational reasons. These digital library resources include multimedia, image-based products, audio-visual materials, e-books, e-journals, e-theses, e-newspapers, e-databases, and multimedia (David-West, 2022; Mukhtar & Maidabino, 2012; Saklani, 2020; Anhwere & Manu; 2020; Akuffo & Badu, 2019; Siwach & Malik, 2019). Undergraduate students also utilise the Google search engine for learning (Okocha & Owolabi 2020). According to the authors, the Google search engine is widely utilised because of its transparency and dependability. Furthermore, empirical research has shown that undergraduate students use a variety of offline and online resources. For instance, Siwach and Malik (2019) provide an empirical study on how undergraduate students, faculty members and researchers in selected North Indian colleges use digital information resources. The study reveals that Springer Link, Science Direct, Web of Science, and SciFinder Scholar are among the databases that undergraduate students utilise the most.

However, numerous studies have found that undergraduate students at universities are not making the most use of digital library resources, and this is a prevalent issue in both developed and developing nations. 42 percent of respondents to a study by Amaya and Secker (2016) in the United Kingdom said they preferred accessing print library resources over electronic ones. In a related study on the "academic reading format of students around the world," conducted in the United States and the United Kingdom, Mizrachi et al. (2016) discovered that students strongly prefer print information resources over digital library resources. According to a study by Mizrachi et al., 67.7% of research participants prefer to look for information in print over digital media. Pesut and Zivkovic (2016) found that 82

percent of participants in another empirical study done in Croatia preferred using print information resources over digital ones.

Studies conducted in various developing nations, including Tanzania, Ghana, Oman, India, and Israel, have also revealed that undergraduate students have a stronger preference for print information resources compared to digital library resources (Hamshri, 2019; Siwach & Malik, 2019; Aharony, & Bar-llan, 2018). The aforementioned situations were also noted in Nigeria. According to a study by Yakubu (2018), undergraduate students at two universities in Niger State visited and used printed books in the libraries more frequently than they did electronic information resources. In light of this, comprehending how undergraduate students use digital library resources for learning is a crucial component that requires more thought from researchers, as this study does.

Information Searching Skill for Learning among Undergraduate Students

The ability to search for information is one facet of "digital literacy." The American Library Association (ALA), (2018) defines digital literacy as the "ability to use information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills." The ability to use technological tools like computers, the Internet, Smartphone, eReaders, and other mobile devices is a prerequisite for being considered digitally literate. Basic digital abilities necessitate the possession of basic skills such as typing, internet literacy, the capacity to access multimedia resources like audio and video files, and the ability to complete tasks using social media and mobile devices. Professional skills that contribute to proficiency are necessary in addition to the fundamentals. Functional skills, collaboration skills, critical thinking and assessment skills, and the capacity to locate and select information are a few examples of these skills (Panduwinata & Setiawata, 2024; Teacher Registration Council of Nigeria, (TRCN), 2021).

Information searching skills are necessary for students to locate and select information efficiently. Lack of or insufficient digital information literacy will woefully affect students' ability to critically process the vast amount of information available in the digital space (Mrah, 2014). According to theoretical viewpoints, an individual's information behaviour, information seeking behaviour, and information searching behaviour are all related (Tariq, Mahmood, Ur Rehman, & Mustafa, 2018). Similar to this, Leckie's (1996) Information Seeking Professional Model hypothesised that information searching skills influence the use of information sources. Numerous academics have examined students' information-searching skills and how they relate to the use of digital information resources from an empirical perspective. Panduwinata and Setiawata (2024) have reported that digital literacy has a significant influence on critical thinking skills. Nonetheless, it's interesting to note that results from earlier studies have shown inconsistent outcomes from various regions of the world. Studies (Thindwa, Chawinga, & Dube, 2019; Ezra, Paul, & Peter, 2018; Lefuna, 2017; Adeleke & Nwalo, 2017), for instance, have recognised that students' information-searching skills were insufficient. In a similar vein, students' information searching skills are generally good, according to a study

by Adebayo, Michael, and Akole (2017) on the "Information Searching Skills of Medical Students of College of Medicine University of Ibadan, Nigeria." In a similar vein, Tariq et al. (2018) examined the undergraduate, graduate, and postgraduate online information searching (OIS) skills of business students in Lahore, Pakistan. The study discovered that students' skills to find information were at a satisfactory level. Furthermore, Nsirim (2020) studied how Rivers State University undergraduate students use the library, their information needs, and their information-searching techniques. The study's findings indicated that most respondents had fair information-searching skills. To this end, this study attempts to understand the information searching skills of undergraduate students in universities in Yobe State, Nigeria, with the hope of contributing to the nuanced discussions in the area. This is due to the wide disparity in information searching skills among undergraduate students in different fields and countries.

Methods

The study used a survey research design with a quantitative research methodology. 14,141 undergraduate students from Federal University Gashua and Yobe State University Damaturu are the target population. Proportionate stratified random sampling techniques were employed to choose the study sample in order to guide the investigation. A self-administered questionnaire was used to collect the data, which were then analysed using descriptive and inferential statistics.

Validity and reliability tests were carried out to guarantee accurate measurement as well as the stability and consistency of the questionnaire. A questionnaire for the face and content validity test was distributed to experts in several categories. Conversely, the Cronbach Alpha Coefficient was used to guarantee the dependability test. 3.0 were chosen as the midpoint of the mean value for statistical decision-making. A mean score of more than 3.00 denoted agreement, whereas a score of less than 3.0 denoted disagreement.

Results

The targeted respondents in the study received a total of 384 copies questionnaires from the researcher. A total of 324 questionnaires were properly completed and returned, which makes 82.5% response rate.

RQ 1: What types of Digital Library Resources is use for Learning by Undergraduate Students?

Table: 1 Types of digital library resources use by the respondents

	NU		AN		Occasionally		AE		FU		Mean	STD
Items	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**		
E-journal articles	27	8.3	81	25.0	54	16.7	108	33.3	54	16.7	3.25	1.24
E-books	54	16.7	81	25.0	0	0	135	41.7	54	16.7	3.17	1.41

E-databases	81	25.0	108	33.3	27	8.3	108	33.3	0	0	2.50	1.19
E-projects	27	8.3	162	50.0	54	16.7	81	25.0	0	0	2.58	.96
E-theses & Dissertations	54	16.7	108	33.3	54	16.7	81	25.0	27	8.3	2.75	1.24
E-Newspaper	27	8.3	54	16.7	27	8.3	135	41.7	81	25.0	3.58	1.26
E-Magazines	135	41.7	162	50.0	0	0	27	8.3	0	0	1.75	1.01
E-conference	162	50.0	135	41.7	0	0	27	8.3	0	0	1.75	1.01
Online dictionaries	81	25.0	54	16.7	27	8.3	54	16.7	108	33.3	3.17	1.62
Online encyclopaedia	108	33.3	135	41.7	27	8.3	54	16.7	0	0	1.75	1.01
Online maps and atlases	81	25.0	108	33.3	27	8.3	108	33.3	0	0	2.50	1.19
Online abstracts and indexes	108	33.3	135	41.7	0	0	54	16.7	27	8.3	1.67	1.02
										Grand mean	**2.53**	

NU= Never use 1; **AN**= Almost never 2; **O**= Occasionally 3; **AE**= Almost every time 4; **FU**= frequently use 5; **STD**= Standard deviation, **F**= Frequency

When asked if they use digital library resources for learning, as Table 1 illustrates, respondents said they do so for e-journal articles (Mean=3.25), e-books (Mean=3.17), e-newspapers (Mean=3.58), and online dictionaries (Mean=3.17), in that order. Based on the results, it can be concluded that the majority of respondents agreed to use these resources practically always. Additionally, the majority of respondents acknowledged that they occasionally utilise these digital library resources for learning, according to the results for e-theses and dissertations with (Mean=2.75), e-projects with (Mean=2.58), e-databases, and online maps and atlases (Mean=2.50, respectively). On the other hand, a concerning outcome is linked to the utilisation of electronic periodicals, electronic conference proceedings, and online encyclopedias with (Mean=1.75 correspondingly) and online abstracts.

The findings showed that the majority of respondents hardly ever used these online learning resources from digital libraries. The respondents do not regularly use the digital library resources for learning, according to the (cumulative mean=2.53). This finding implies that in order to guarantee that undergraduate students regularly use digital library resources for studying; greater awareness and training are required.

RQ 2: What is the Information Searching skills use for Learning by the Undergraduate Students?

The respondents' information searching skills varied somewhat (Table 2). While the majority of respondents disagreed with the notion that they have operational searching skills, the majority did say that they can open websites (Mean=3.25), navigate pages (Mean=3.08), open file formats (Mean=3.25), and changing browsers (Mean=3.00). It was evident that there were serious issues when looking at strategic internet skills for utilizing DLRs. The majority of respondents disagreed with all five of the required responses, with mean deviations falling below the 3.00 agreement level, suggesting a lack of these skills. The vast majority of respondents acknowledged that they lacked formal searching skills, with the mean deviation of all the items clustered below 3.00.

In addition, the outcomes for non-formal seeking abilities were really encouraging. The majority of respondents concurred that they can choose a website or search system to seek information (Mean = 3.58), formulate and define search options or queries (Mean = 3.17), and use a website or search system to find information. On the statement "I can evaluate web information sources," however, a larger portion of the respondents expressed dissatisfaction (Mean = 2.83). A judgment (Mean=2.83) unequivocally demonstrates that a higher proportion of the undergraduate students concurred that they lack the information-searching skills required to make advantage of digital library resources. These results suggest that the undergraduate students in the study area require greater instruction in digital skills.

Table 2: Respondents' perceptions on information searching skills use for learning

Items	SD		D		UD		A		SA		Mean	STD
	F	%	F	%	F	%	F	%	F	%		
Operational Searching skills on the Use of Digital Resources												
I can open websites by entering the URL in the browser's location bar	27	8.3	81	25.0	54	16.7	108	33.3	54	16.7	3.25	1.24

I can navigate forward and backward between pages using the browser buttons	54	16.7	81	25.0	27	8.3	108	33.3	54	16.7	3.08	1.38
I can open various common file formats (e.g., PDF)	54	16.7	54	16.7	54	16.7	81	25.0	81	25.0	3.25	1.24
I can bookmark websites	108	33.3	81	25.0	27	8.3	54	16.7	54	16.7	2.58	1.50
I can change the browser's preferences	81	25.0	81	25.0	81	25.0	81	25.0	81	25.0	3.00	1.58
Strategic Internet Skills												
I am aware of the opportunities that the web offers and I take advantage of these opportunities for a particular personal or professional goal	108	33.3	81	25.0	27	8.3	54	16.7	54	16.7	2.58	1.50
I can combine the various possible	54	16.7	135	41.7	27	8.3	54	16.7	54	16.7	2.75	1.36

information sources to achieve the best means for the goal desired												
I can decide on what site am I going to visit, what search engine am I going to use or am I to use a database or not?	108	33.3	81	25.0	27	8.3	81	25.0	27	8.3	2.50	1.39
I gain the benefits (personal, social, professional and or educational) by achieving this goal.	108	33.3	108	33.3	0	0	27	8.3	81	25.0	2.42	1.38
Formal searching skills												
I am able to recognize and click links that are embedded in different formats such as text, images, menus and	81	25.0	108	33.3	27	8.3	108	33.3	0	0	2.50	1.19

website lay-outs												
I do not become disoriented when navigating within a website	27	8.3	162	50.0	54	16.7	81	25.0	0	0	2.58	.96
I do not become disoriented when navigating between websites	54	16.7	108	33.3	54	16.7	81	25.0	27	8.3	2.75	1.24
I do not become disoriented when browsing through and opening search results	81	25.0	135	41.7	0	0	54	16.7	54	16.7	2.58	1.44
Informal Internet Skills												
I can choose a website or a search system to seek information	27	8.3	54	16.7	27	8.3	81	25.0	135	41.7	3.58	1.26
I can formulate and define search options or queries	54	16.7	54	16.7	54	16.7	108	33.3	54	16.7	3.17	1.35
I can select the most	54	16.	81	25.	0	0	13	41.	54	16.	3.17	1.4

relevant results or information (on websites or in search results)		7		0			5	7		7		1
I can evaluate web information sources	27	8.3	135	41.7	27	8.3	81	25.0	54	16.7	2.83	1.52
										Grand mean	**2.83**	

SA= strongly agree **5; A**= Agree 4; **UD**= Undecided 3; **D**= Disagree 2; **SD**= strongly disagree 1; **STD**= Standard deviation

Result of Hypothesis Testing

H_1: There is no significant relationship between Information Searching Skills and Use of Digital Libraries Resources

Table 3:
N= Number of responses; SD= Standard deviation; P= Probability value

Variables	N	Mean	SD	P-value
Information searching skills	324	1.83	.898	.666**
Use of digital library resources	324	2.59	.777	

PPMC analysis is applied to the data in order to test this hypothesis. With a 95% confidence level and a 0.05 level of significance, the computed result (p-value) is.666. This finding leads to the conclusion that among undergraduate students in the study area, there is a positive correlation between information seeking skills and use of digital library resources. Consequently, the study's null hypothesis is rejected.

Discussion

a) Use of digital library resources

The study's findings showed that participants almost every time use online dictionaries, e-books, e-journal articles, and e-newspapers. The majority of respondents did not frequently use other digital library resources such as online abstracts and indexes, e-databases, e-theses and e-dissertations, e-magazines, and e-conference proceedings. Instead, they just occasionally employed them. Prior researches (Bamidele et al., 2018; Bala, Bansal & Sharma, 2018; Aladeniyi, 2017; Qasim & Khan, 2015; Tella, Orim, Ibrahim, & Memudu, 2018) have also revealed similar findings, namely that undergraduate students primarily use e-journal articles, e-books, and e-newspapers for learning purposes as opposed to other digital library

resources. Furthermore, our results provide support to the notion that undergraduate students favour using physical library resources over digital ones (Hamshri, 2019; Siwach & Malik, 2019; Aharony & Bar-llan, 2018). These results imply that undergraduate students are not making the most frequent use of digital library resources for learning purposes. Therefore, the management of libraries should concentrate their efforts on using digital library resources. In addition to educating students on the value and necessity of utilising a variety of digital resources found in libraries to meet their learning objectives, management may ensure that programs for digital literacy are in place.

b) Information searching skills

The findings of the study showed that although undergraduate students lack the skills to bookmark websites, they do possess operational searching skills when it comes to using digital library resources. These skills include opening websites by typing the URL into the browser's location bar, using the browser's buttons to navigate between pages, opening common file formats like PDFs, and adjusting browser preferences. Furthermore, the study found that although the respondents had informal Internet skills, they lacked formal information searching and strategic internet skills. This result is consistent with a growing body of prior research (Okocha and Owolabi, 2020; Thindwa, Chawingra & Dube, 2019; Scoulas & De Groote, 2019; Reddy, Krishnamurthy & Asundi, 2018; Mizrachi, Boustany, Kurbanoğlu & Doğan, 2016; Kadli & Hanchinal, 2015) that showed low and poor information searching skills among undergraduate students. The importance of information searching skills has been emphasised. For instance, Panduwinata and Setiawata (2024:609) hold the view that ‘‘student’s digital literacy can aid in collecting, organising, and analysing data, as well as synthesising information from various digital sources’’.

These results indicate that undergraduate students lack information searching skills, which has significant implications for researchers and library management. The management of libraries should create workshops and training programs for students to improve their digital literacy. Basically, the priorities should be raising awareness and providing tutorials and primers. However, to find out what might be impeding undergraduate students' ability to search for information and use digital library resources, researchers in the fields of applications design and digital librarianship should do studies.

Conclusion

This study investigates information searching skills and use of digital library resources for learning by undergraduate students in universities in Yobe State, Nigeria. According to the study, the majority of respondents lacked the necessary skills to navigate and utilise digital library resources. A significant portion of those surveyed concurred that their use of digital library resources was restricted to electronic journals, e-books, e-newspapers, and online dictionaries, with inadequate use of other crucial resources like e-databases, e-projects, e-theses and dissertations, e-magazines, and e-conference proceedings. From the aforementioned, it is

reasonable to infer that undergraduate students' inadequate information-searching skills contribute to their poor usage of digital library resources. The results of this study can therefore be used as a guide by digital librarians, application designers, and library management to create and promote features that will entice library users to use their services and goods.

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Information Sharing Strategies of Smallholder Farmers for Agricultural Systems in Katsina State

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Abstract

This study identified Smallholder Farmers' (SHF) information sharing strategies used for agricultural system. Two research questions and one hypothesis were developed to guide the study. Cross sectional survey design was adopted in which a total of seven hundred (700) smallholder farmers under registered cooperative associations from three agricultural zones of Katsina state formed the population. A total number of two hundred and eighty (280) respondents were randomly sampled using cluster sampling technique. Data were analyzed using descriptive and inferential statistics in which the null hypothesis was tested using Pearson Product Moment Correlation Coefficient (PPMCC). The analysis revealed that there was positive and strong correlation of about 50% in the variation of the level of information sharing strategies of farmers and types of information shared while the remaining percentage of the variation is being influenced by other factors. The findings show the overall strategies used by the farmers to share information for their farming systems which includes; verbal communications, face-to-face interactions, farm visits, extension workers and phone calls. The findings also revealed that majority of SHFs in Katsina state share different types of information among themselves to solve problems related to their agricultural systems. The study recommends that government should design information sharing strategies with social media platforms to assist farmers with modern communication strategies that can complement the traditional strategies for effective information sharing among small holder farmers.

Keywords: Information Sharing, Agricultural Systems, Smallholder Farmers.

Introduction

Information is very critical and plays a fundamental role in supporting agricultural systems irrespective of the status of farmer. Various researches have been conducted on small scale farming and stressed the importance of information for agricultural developments. Ramberg (2020) stated that it is very common farmers gain information and knowledge from other farmers since the information is

accessible and do not require costly inputs. Therefore farmers need to have and share information for a better result in their farming system.
Information sharing simply refers to communication between two or more partners through a particular medium. It can also be seen as a process in which ideas, knowledge and information are exchanged between individuals. Uzezi (2015) noted that, information sharing is a channel through which information is transferred and exchanged from one person or source to another. So effective information sharing could eradicate ignorance and provide the knowledge required to achieve desired economic gross and development. Information sharing play a critical role to the farmers to identify and solve their problems as well as assisting them to improve their farming activities.

Smallholder farmer is an individual person male or female who can cultivate less than 3 hectors of land, using local farming and defend on rain fed system. Nyoni R. S. et al (2024) stated that, seventy percent of smallholder farmers in Africa depend on rain fed farming systems, making them vulnerable to climate variability and extremes.

Katsina state was created in 1987 and it comprises Katsina and Daura Emirates and it borders Kaduna State to the south, Jigawa and Kano states to the east; Zamfara state to the west and shares an international border with Republic of Niger to the north. It occupies an area of about 24,192 square kilometers, with an estimated population of about 5.8 million people. Katsina is a mono ethnic and monolingual state and the people are generally Hausa/Fulani. The major cash crops produced in the state are millet, guinea corn, groundnut, cotton, maize, beans, rice and wheat. Minerals are also found in the region which includes: Kaolin, asbestos, gold, uranium, nickel, chromites and silica sand. (Katsina State Investor's Handbook: 2016). There are two seasons in the state which includes wet and dry seasons. The wet season starts from the months of June to September and the dry season from October to May. The dry season is usually dominated by the north-east trade wind which is dry and dusty, popularly called the "harmattan". The mean daily temperature ranges between 16 and 40°C while the annual rainfall ranges between 300 and 400 mm in the Sahel, 600 to 800 mm in the Sudan savannah and 900 to 1100 mm in the northern guinea savannah (Gambo: 2017). However, 75% of the populations are involved in subsistent farming and livestock rearing and engaged in markets and small businesses. (Katsina State Investor's Handboo: 2016).

Statement of the Problem

Information plays a dominant role in the life of small holder farmers and is essential for facilitating farming systems. Katsina state government is committed in boosting agricultural farming systems for economic survival and livelihood of common citizens. Ladan (2017) stated that, in many states of the federation, particularly those in the northern part conscious efforts are being made to develop farming as source of food, income and employment generation. Katsina State Agricultural and Rural Development Agency (KTARDA) in collaboration with the state government initiated a new agricultural farming support system with new technologies and

innovations to support small and medium farmers to increase food crop production and boost the states' economy.

But two years after the program has taken up, the agricultural systems was not encouraging and the SHFs could still not produce sufficient foods for the state's consumption despite the existing relevant interventions put in place by Katsina state government as reported in (2016) by Katsina State Agricultural and Rural Development Agency (KTARDA). The researchers want to ascertain whether the small holder farmers could not have effective information strategies or do not have culture of sharing information. for their farming systems Therefore, the aims is to find out the strategies employed and types of information shared by small holder farmers in Katsina state for effective information sharing and maximum productivity in farming systems.

Research Questions

1. What types of information shared by small holder farmers for agricultural systems in Katsina State?
2. What information sharing strategies are used by small holder farmers for agricultural systems in the state under study?
3. What challenges affect information sharing strategies employed by the farmers in the area under study?

Research Hypothesis

Ho 1: There is no significant relationship between the information sharing strategies used and types of information shared by small holder farmers in Katsina state.

Literature Review

Information sharing strategies can be described as communication between two or more partners through a particular medium, or an active, dynamic process in which ideas and information are exchanged. Information sharing strategies can also be described as channels used in transferring and sharing agricultural information among farmers. There is need for good information flow and effective information sharing among farmers for better performance and maximum productivity for their farming activities. Studies were carried out on information sharing from the various locations. Hilary et al (2017) stated that information sharing has been regarded as an effective predictor factor of a value chain's effectiveness and contributes largely to improve relationships between suppliers by facilitating efficient coordination and responsiveness as well as integration of partners' information systems. A trusting relationship encourages interaction among value chain actors and further enhances the benefit of information sharing. The lack of trust in agriculture extension workers resulted into farmers being reluctant in accessing information from them. Information sharing has enabled increased yields, well informed decisions and reduces losses. *Ramberg* (2020) stated that, agricultural extension has traditionally focused on transfer of information and knowledge sharing on agriculture from professional extension workers to farmers. He also added that, smallholder farmers knowledge sharing is taken place in the village learning centres, social events, collaborations, social relations and social network platforms through different forms

of farmer groups. Therefore, this means that small holder farmers shared information through traditional means than to use new technology strategies and it will bring more benefits and opportunities to share many information.

The Type of Information Shared by Smallholder Farmers for Farming Systems

Farmers in Katsina mostly shared information for many purposes of their farming activities, from the research findings it revealed that farmers shared information on problem solving with highest percentage 97.25%, followed by information on new methods of farming with 94.90%. It also revealed that, 92.94% of the farmers shared information for new technology while 90.59% for maximum productivity of farm produce. It could be said that, these are the reasons that push farmers to share information among them and extension workers for farming activities. However, the result revealed that 65.49% of the respondents shared information when government has new policies on agriculture. It is observed that some government new policies are not suitable for SHFs to comply, that was the reasons for not sharing such information. Farmers shared information about farming techniques through extension workers to any threat to the development of the agricultural system in their locality.

Information Sharing Strategies Used by Farmers for Farming System

Information sharing in agriculture refers to a scenario where two or more value chain actors (which could include smallholder farmers) share data amongst themselves under a set of binding principles and agreements, allowing for a reduction in the quantum of data collected and a re-use/recycling of already collected data. By streamlining and reducing duplication of data, information sharing can potentially internalize leakages in resources used to manage agricultural information, the benefits from which can be transferred to smallholder farmers in the form of reduced costs of service delivery, or better designed services. (World Bank 2023). Muhanguzi and Ngubiri (2022) opined that, agricultural information can enhance smallholder farmers' knowledge sharing and decision-making ability. Hence fourth, there is need for small holder farmers to have effective and reliable information sharing strategies. Masuki, et al. (2010) discussed strategies used by farmers in sharing information as follows:

1. Correspondence: This is a non-concurrent but a remote communication strategy between farmers which includes: letters, newsgroups, face-to-face interactions, focus groups and debates.
2. Interpersonal channels: These involve one-on-one conversations with many people within a society that includes extension work, toll free lines, video and audio clips among farmers.
3. Training strategies: Government information units can be used to equip public relation officers and journalists with knowledge and skills for reporting on agricultural issues and awareness
4. Publication: Publication may take the form of brochures, calendar of events, information bulletins like folders, pamphlets, newsletters, and annual reports, among others.

5. Public events: These strategies could be used for educational and awareness purposes to share agricultural information and environmental disaster awareness. Z
6. Socio-Cultural marketing: culture and use of non-traditional forms of media such as traditional dances, drama, community theatre, poetry, song and debates.
7. Media: farmers receive and share information through a variety of communication media which includes; radio, television, mobile phones, village meetings, leaflets among others.

Ndilowe (2013) stated that, interpersonal communication emerged as one of the most effective strategies used when communicating to farmers. Information whether print, electronic or verbal plays a critical role in farming system which needs to be taken into great consideration. This strategy refers to oral or verbal personal communication use for sharing information among farmers. Mabuku (2015) supported that oral communication was the most preferred communication strategy but it was revealed in many researches that farmer's education had an influence on the strategy of communication that farmers with no formal education or those in primary and secondary levels relied heavily on oral (verbal) communication. Moreover, print resources such as pamphlets, posters and magazines on various aspects of agriculture are also used as a means of strategies used by smallholder farmers for information sharing.

Abcic (2016) elaborated information sharing strategies of farmers as a linked with the Information and Communication Technologies (ICT) which includes the use of internet and social network to share information among small holder farmers to support their farming activities. The extension agents cannot reach every farmer, so mass media could be used to share information among small holder farmers from various destinations. This cannot be achieved without assembling all the necessary technologies to handle information and facilitate communication among farmers.

It can be observed that, small holder farmers prefer getting information through oral communication which enable them to clarify issues. For instance, if there is a new technology introduced, it will be difficult for them to accept unless the extension workers demonstrate how a particular technology works, because they are more comfortable with the use of traditional strategy. Based on the knowledge of researchers and empirical studies carried out, it is noted that no study was conducted to investigate the information sharing strategies of SHFs in the study area.

Small holder farmers share information face-to-face through village meetings, market or religious gathering, in the farms or at the family houses, these strategies can be able to solve farmers problems and have their own development process as well as reducing the damages for their farming system. Therefore, information sharing strategies will be an important tool for the policy formulation and implementation for more successful farming systems.

Challenges of Information Sharing Strategies Used by Farmers

Hilary et al. (2017) conducted a study on information quality, sharing and usage in Uganda, and stated that, most farmers were unwilling to share information that may put them at a competitive disadvantage. As a result, tremendous amounts of information remain inaccessible to other value chain actors. The findings shows that SHFs were facing infrastructure shortage (power), lack of money to buy mobile phone, radio and service fee, lack of interest, incompatible format where the information is packed, and maintenance problem. The study of Hilary, et al (2017) further revealed some challenges of information sharing as include:

a. Lack of feedback: Limited feedback from information seekers led to lack of trust. There is a risk of acting against one another's interests rather than working toward common objectives. Positive feedback is very important in information sharing to avoid information distortion.
b. Language Barriers: The study further revealed language barriers was a challenge of information sharing. Handbooks were written in English languages for the farmers to comprehend, this simply highlight the information gaps exist due to language barriers and mind set of some actors.
c. Limited knowledge on use of smart phones: with the aid of high-speed cellular network, any video, audio, or multimedia files can be shared through the use of mobile phones. The study revealed that, there was limited knowledge on the use of smart phones by farmers among others.

Rafaeli, and Raban (2005) identified some problems of information sharing via technology channels of SHFs, it was revealed that, the problem of information sharing may stem from the medium used rather than from the willingness to share. Information sharing also may be affected by a host of additional factors, individual differences and educational background among others.

Aina (2007) stated some problems with sharing and dissemination of agricultural information in Africa thus include; inadequate financial power of farmers in Africa, Illiteracy of African farmers. Majority of them cannot read or write in any language. African farmers live in areas, where there is lack of basic infrastructure, such as telephone, electricity, good road network, few numbers of extension workers, and poor radio and television signals in most communities among others.

Food and Agricultural Organization of the United Nations (FAO) ;(2021) stated that farmers share a lot of valuable information with several other actors in different data value chains, e.g. with technology providers for precision agriculture decision support systems; with suppliers and distributors for data exchange in the supply chain; with farmers' associations for the purpose of registration and service provision; with banks for financial assessment; and with governments for subsidy eligibility and compliance, etc.

Methods

The main objective of the study to investigate information sharing strategies and types of information shared by SHFs in Katsina State and make recommendations to solve the problems associated with farming activities. Cross sectional survey

design was used in this study for estimating the prevalence of farmer's information sharing strategies and information they shared among themselves. Sedgwick (2014) justify that, the cross sectional survey is generally quick, easy, and cheap to perform. However, a cross sectional study was prone to non-response bias if participants who consent to take part in the study differ from those who do not, resulting in a sample that is not representative of the population. The target population of this study is 700 registered farmers, 280 were the sample size, cluster sampling technique was used while descriptive and inferential statistics was also used in data analysis. The researchers used Diffusion of Innovations Theory (DOI) to study strategies used for effective information sharing which can be used to enhance farming systems in the study area.

Results

1. Response Rate

Table.1: Frequency and Percentage of Questionnaires distributed to SHFs

Questionnaire	**Frequency**	**Percentage %**
Administered	280	100
Returned	255	91.1
Not returned	25	8.9

Table 1 shows that 280 copies of questionnaire were distributed from which two hundred and fifty-five (255) representing 91.1 % of the total number of instruments distributed were returned and found useful. This shows high response rate in terms of administration of the instrument for the study which could be attributed to the determination and commitment of both researchers and research assistants in terms of distribution and collation of the instruments as well as the good understanding between researchers and respondents.

2. Demographic Data

Table 2: Demographic Data of the Respondents

SN	**Items**	**Description**	**Number of Respondents**	**Percentage (%) of Respondents**
1	Local Government Area	Kafur	67	26.27
		Kurfi	93	36.47
		Mashi	95	37.25
	Total		**255**	**100 %**
2	Gender	Male	217	85.10
		Female	38	14.90

3	Age	Below 20 years	13	5.10
		21 – 30 years	58	22.75
		31 – 40 years	49	19.22
		41 – 50 years	82	32.16
		51 years and above	53	20.78
	Total		**255**	**100 %**
4	Educational Level (Certificate)	Adult Mass Literacy	11	4.31
		Primary School Leaving certificate	33	12.94
		Secondary Sch. Leaving certificate	65	25.49
		NCE/OND	96	37.65
		Others	50	19.61
	Total		**255**	**100 %**
5	Experience in Farming activities	1 – 5 years	28	10.98
		6 – 10 years	59	23.14
		11 – 20 years	58	22.75
		21 – 30 years	65	25.49
		31 years and above	45	17.65
	Total		**255**	**100 %**

(Source: Field Data, 2018)

Table 2 demonstrates a demographic data of SHFs in the area of study. Concerning the gender, most of the SHFs are males (85.1%), with insignificant percentage of female farmers. In terms of the respondent's age group, the result indicates wide differences with 5.10% of the respondents below 20 years of age. It revealed that majority of farmers fall within the range of forty-one to fifty years and the subsequent ages as indicated above. With respect to the respondents' educational level, the study demonstrates that 37.7% of the respondents possessed the Nigeria Certificate in Education (NCE) and the National Diploma (ND) while 25.5% were Secondary School Certificate holders. The least privilege which was 12.9%, were Primary School Leaving Certificate holders; 4.31%, were holders of Adult Mass Literacy Certificate and 19.6%, were holders of other certificates. With regards to farming experience, the result revealed significant percentages of farming experiences across the levels of all ages. It revealed that 25.49 % and 23.14 % are within the ages of 21 to 30 years and 6 to 10 years respectively. 22.75 % were within the ages of 11 to 20 years, and 17.65 % were within the ages of 31 years and above, only 10.98 % falls within the range of 1 to 5 years of experience in farming activities.

RQ 1. Information Sharing strategies employed by Small Holder Farmers

Table 3: information Sharing Strategies Used by SHFs

SN	Strategies	Agree		Disagree	
		Frequency	Percentage (%)	Disagree Frequency	Percentage (%)
1	Face to face interaction	233	91.37	22	8.63
2	Extension workers	240	94.12	15	5.88
3	Oral/verbal communications	245	96.08	10	3.92
4	Phone calls	182	71.37	73	28.63
5	Farm visits	230	90.20	25	9.80
6	Town criers	185	72.55	70	27.45
7	Social medias	210	82.35	45	17.65

(Source: Field Data, 2018).

Table 3 shows that the information sharing strategies used by SHFs in Katsina state are very common. The highest of the strategies as agreed by the farmers is oral/verbal communications with 96.08% followed by extension workers with 94.12%. It also revealed that 91.37% and 90.20% used face to face interaction and farm visits to share information respectively. Significant percentages also indicated that 82.35% and 72.55% used social media and town criers respectively. These could be also attributed to the farmers' experiences and background knowledge in farming activities as well as less stress to their satisfactions. However, the data revealed that, phone call being the least but with significant percentage of 71.37% while 28.63% disagreed in using phone calls as strategies for information sharing. This could be attributed as the result of cost of phones and money to buy airtime credits.

RQ 2. Types of Information Shared by Smallholder Farmer in Katsina State

Table 4 Information Shared by Farmers

SN	Information shared	Agree		Disagree	
		Frequency	Percentage (%)	Frequency	Percentage (%)
1	New methods of farming information	242	94.90	13	5.10
2	Problem solving information	248	97.25	7	2.75

3	New technology of farming	237	92.94	18	7.06
4	Maximum productivity of farm produce	231	90.59	24	9.41
5	Government new policies on agriculture	167	65.49	88	34.51

(Source: Field Data, 2018)

Table 4 shows that farmers mostly shared information for many purposes of their farming activities. Information shared on problem solving has the highest percentage 97.25%, followed by information on new methods of farming with 94.90%. It also revealed that, 92.94% of the farmers shared information for new technology while 90.59% for maximum productivity of farm produce. It could be said that, these are the reasons that push farmers to share information among them and extension workers for farming activities. However, the result revealed that 65.49% of the respondents shared information when government has new policies on agriculture, but 34.51% disagreed.

RQ 3 Challenges Affecting Information Sharing Strategies Employed by SHFs

Table 5: Challenges of Information Sharing

SN	Challenges	Frequency	Percentage (%)
1	Lack of transportation services in the rural areas	211	82.75
2	Poor knowledge sharing culture of small holder farmers	194	76.08
3	Lack of public libraries and information centers in the rural areas	208	81.57
4	Lack of technical knowledge on how to use ICT	242	94.90
5	Uncovered age network services in rural areas	217	85.10
6	High cost of smart phones and data for network plan by farmers	224	87.84
7	Lack of understanding and political conflict in rural areas	208	81.57

(Source: Field Data, 2018).

Table 5 indicated that lack of technical knowledge on how to use ICT with 94.90% was the challenge that had the highest percentage. High cost of smart phones and data for network plan had 87.84%. The result also revealed that uncovered age network services and lack of transportation services in the rural areas had 85.10% and 82.75% respectively. However, it revealed that lack of public libraries and information centers as well as lack of understanding and political conflict in rural areas had 81.57%. Poor culture of SHFs with 76.08% was the challenge that had the least percentage.

Null Hypothesis of the Study

$H0_1$ There is no significant relationship between the information sharing strategies used and types of information shared by small holder farmers in Katsina state.

Table 6: Summary of the Relationship between Information Sharing Strategies and Agricultural Systems

	Mean	Std. Deviation	N
Information Sharing Strategy	29.502	3.8790	255
Types of Information Shared	8.749	1.4499	255

The results in table 6 present the summaries of the descriptive statistics of the relationship between the information sharing strategies and types of information shared by SHFs in Katsina state. A total of 255 samples were computed. They revealed a mean score of the farmers' information sharing strategies as 29.502 while the mean score of types of information shared as 8.749. This analysis shows that there is a significant difference between the means of the variables.

Table 6: Correlations between Information Sharing Strategies and Agricultural Systems

		Information Sharing Strategies	Types of Information Shared
Information Sharing Strategies	Pearson Correlation	1	.480**
	Sig. (2-tailed)		.000
	N	255	255
Types of Information Shared	Pearson Correlation	.480**	1
	Sig. (2-tailed)	.000	
	N	255	255

**. Correlation is significant at the 0.01 level (2-tailed).

Table 6 represents the Pearson's Product Moment Correlation (PPMC) of the hypothesis of the study on the level of information sharing strategies and types of information shared by the farmers in Katsina state. The analysis revealed that the relationship is positive with a strong correlation between the variables; about 50% in the variation of the level of information sharing strategies of farmers is explained by the variation in types of information shared by SHFs while the remaining percentage of the variation is being influenced by other factors in the study area. The correlation is (r (253) = .480, n=255, p=.000, i.e. less than 0.05).

Accepting or Rejecting the Null Hypothesis Two ($H0_2$) of the Study

If the P value significant level is less than 0.05 ($p < .05$) the Null Hypothesis of the study will be rejected, while if the P value significant level is greater than 0.05 ($p > .05$) the Null Hypothesis of the study will be retained. Therefore, according to this analysis, the Null Hypothesis is rejected ($p < 0.05$ i.e. Sig = 0.000), because there is sufficient evidence of significant correlation (r (253) = .480, n=255, p=.000, i.e. less than 0.05) between the level of Information Sharing Strategies and extent of types of information shared. That is, there is a statistically significant relationship between the information sharing strategies used and types of information shared by SHFs. The variations in the mean of the dependent variable (types of information shared) is not happening by chance but as the result of the influences of information sharing strategies adopted by the SHFs in the study area..

Discussion

The study shows that farmers prefer traditional method of getting information through verbal communication strategies which brings more benefits, though at the present time, there is Information Communication Technology (ICT) and social networks that can be used to share information such as use of face book, WhatsApp and mobile phones to make calls or send messages which could have increased the effectiveness of information sharing strategies and gave assurance for effective and efficient communication that need farmers also to use and adopt. This corroborates with the statement of Hilary et al. (2017) that information sharing has been regarded as an effective predictor factor of a value chain's effectiveness and contributes largely to improve relationships between suppliers by facilitating efficient coordination and responsiveness as well as integration of partners' information systems. But contrary to the findings of Abbas (2015), which reported that farmers in Nigeria share and disseminate information via mobile telephones.

Though there was insignificant empirical findings on the types of information shared by famers to the best knowledge of researchers but this study revealed that farmers mostly shared information for many purposes of their farming activities that include; information for problem solving, new methods and technology of farming as well as information when .government has new policies on agriculture. The findings of this study corroborates with the findings of Mabuku (2015) which revealed that farmers preferred information sharing through oral communication strategies that includes; face to face interaction, extension workers, pamphlets, and agricultural dealers which corroborate with the findings of Masuki et al (2010). Thus brings more benefits to them than mass media, print media, ICT media and

interpersonal communication media. But there are some challenges on how small holder farmers use smart phones, unreliable network connectivity and high costs of air time credit

Conclusion

The strategies used by farmers to share information include; face to face interactions, market and religious places, village meetings, among others, with less emphasis on radio, television, mobile phones and ICTs gadgets which are the major modern systems for information sharing. Sharing information in modern or traditional methods both plays a dominant role by assisting SHFs to use new innovative technologies for agricultural systems. Therefore, one promising information strategy that could be employed to share information by SHFs at this present time is a modern method through Information Communication Technologies (ICTs).

Recommendations

1. Government should provide all the necessary support to extension workers and adopt new strategies by using social media platforms to increase effective information sharing for enhancing agricultural systems in Katsina state.
2. Government should provide smart phones to registered farmers through their cooperative associations and network providers should also upgrade their systems with efficient internet connectivity and make subsidy for data subscription to smallholder farmers.
3. Extension workers should create online and social media platforms and train small holder farmers through workshops and market displays on how to use smart phones for information dissemination and sharing.

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Accessibility and Challenges Associated with Digital Library Resources for Learning Among Undergraduate Students in Universities in Yobe State

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Abstract
The paper investigated the accessibility of digital library resources for learning among undergraduate students in Universities in Yobe State. The paper also aimed at identifying the challenges faced by undergraduate students in accessing digital library resources in the universities. The targeted population comprised of the all the undergraduate students of universities in Yobe state, which is 14143. Questionnaire was used as the instrument for data collection. The data collected was analyzed using descriptive statistics. The findings indicated that there was poor accessibility of digital library resources among the undergraduate students. Likewise, the finding showed that majority of the respondents expressed that the accessibility of digital library resources was limited to e-journals, e-books e-newspapers and online dictionaries. While other important digital library resources like e-databases, e-project, e-theses and dissertations, e-magazines and e-conference proceedings among others were also not accessed. The findings further indicated that low bandwidth, poor internet connectivity and poor enabling environment were among the challenges faced by undergraduate students. Therefore, the study recommended that sensitization on the digital library resources should be conducted to the undergraduate students, and the university libraries should addressed the challenges faced by the undergraduate students, this include effective network connectivity, high bandwidth among others.

Key words: Accessibility, Challenges, Digital Library Resources (DLRs), Undergraduate students

Introduction

The importance and wide-ranging scope of Digital Library Resources (DLRs) for general communication, information retrieval and instructional delivery to support teaching and research activities digital libraries is acknowledged worldwide. In view of the above, students, scholars, and researchers use their university websites, CD-ROMs, the Internet, vendor databases, and archives to access digital information resources. Alphonce & Mwantimwa (2019) stated that universities around the world are making significant expenditures to guarantee that their

communities have access to digital information resources by demonstrating their importance to users.

Mishra, Das & Ramesh (2019) Muthurasu & Kannan (2019) defined accessibility as "the ease of finding and approaching digital information resources without stress, as well as its openness and convenience". Access will be as good as the resources which can be afforded with number of computers and existing network systems, the ability to work with tools, and the network infrastructure that supports rapid and convenient connections (Sivasubramaniyan & Batcha, 2012). Also, Sejane (2017) opined that access to digital information resources give the ability to researchers to be more conversant to the work of the scholars globally which enhance research productivity and also incorporates proven facts and knowledge into research. This implies that, digital libraries are important hubs and access point for digital library resources as well as high-quality teaching, learning, and research, they're playing an increasingly vital part in providing better assistance for her users.

However, there are some challenges faced by most of the information seekers especially the undergraduate students. The problem is not limited to African countries alone, it also affect most of the developing countries. For instance in Middle East, Saudi Arabia, Sohail (2017) confirmed some of the problem associated with accessibility and utilization of digital library resources are lack of knowledge on how to effectively use e-journal, lack of facilities, lack of and awareness. He further noted that there is little or no information literacy among most of the science and engineering students across the universities in Saudi Arabia. However, there are some efforts that were made by the management of the universities which include adding basic information literacy in the student's curriculum. Furthermore, In Jordan, Hamshri (2019) outlined some challenges which include lack of training, awareness and orientation are the main challenges faced by the students. Similarly, Humaidat & Yasin (2019) mentioned that majority of the users were encountering challenges in terms of accessing digital information resources due to inadequate information literacy skills.

In Africa, Namibia, Madondo, Sithole & Chisita, (2017) reported that many digital library resources were not accessed by undergraduate at University of Namibia's Northern Campus, and the main challenges identified were shortage of computers, poor internet connections, and lack of information literacy skills. Nonetheless, the study further noted that there was lack of awareness on e-journals among students and scholars; lack of adequate funds for subscriptions of online databases among others. In Nigeria, according to Uzoagba (2019) Ankrah & Atuase (2018) Adeleke & Ngozi Nwalo (2017) Daramola (2017) asserted that lack of information literacy skills, searching skills, inadequate library staff and expertise in computer operations, lack of ICT infrastructure, lack of adequate bandwidth (data for internet connectivity), are among the factors that hinders access of digital library resources in Nigeria.

Statement of the Problem

Today, due to emergence of technology, digital Library resources have become valuable resources that reach students, scholars and other information seekers

without barriers of distance and location. University libraries in Yobe state have invested a lot of funds in acquisition of digital library resources as well as subscription to online databases. Information literacy programs were carried out by the libraries in order to enable the student to get access to digital library resources. However, despite the availability of the digital library resources, it was observed by the researcher that the undergraduate students were not accessing the digital library resources. This could be as a result of lack of awareness or challenges in accessing the digital library resources. It is against this background that this study was embarked upon to investigate the challenges affecting accessibility of digital library resources for learning among undergraduate students of universities in Yobe state.

Research Objectives

The study is set:

1. To find out the level of accessibility of digital library resources by the undergraduate students of the universities under the study.
2. To identify the challenges faced by undergraduate students in accessing digital library resources in the universities under the study.

Literature Review

Accessibility is a general term used to state the degree to which resources, services, products are obtainable by as many people as possible. Aladeniyi (2017) opined that accessibility of digital information resources in the context of research is the process of making digital information materials readily available and reachable for a particular researcher so as to effectively utilize them. This entails that, accessibility of digital information resources is the ease of finding, reachable and gain entry to digital library resources, as well as its openness and convenience. Musa, Sahabi, Lawal & Amishe (2017) observed that accessibility of DLRs is a process of making digital information resources readily available and reachable for information users. To this end, digital inclusion and digital library resources are dependent on access, which is hampered by the ongoing digital era.

Many factors influence access to digital information resources including device ownership, Internet connectivity, information resource availability, and digital accessibility; however, geographic location, age and socioeconomic status are also key factor that aid the accessibility of digital information resources (Fairlie,2017; Walker, Hefner, Fareed, Huerta & Mcalearney 2020). This implies that lack of access to digital library resources or digital instructional materials may adversely affect students' academic success. However, Muthurasu & Kannan (2019) stated that, for users to be able to access and effectively use digital library resources, they must also have adequate skills for searching and retrieving of digital library resources which is information literacy skills.

Saklani (2020) pointed out that accessibility to DLRs can be carried out through the following phases;

1. **Internet Protocol (PI) Based Access to Digital Library Resources**: - This refers to access to DLRs through to subscription to e-resources data bases, the access to such information resources can be done via Internet protocol, students and information seekers can access the DLRs

on all computers, iPod, etc. These electronic devices must be connected to the Internet and browse using the prescribe IP address before accessibility take place (Saklani, 2020).

2. **Remote Access to Digital Library Resources**: - This involves accessibility of the DLRs without necessarily visiting the digital library, accessibility take place when an individual is off campus, at home or abroad, one can access library DLRs (electronic journals, e-books, databases, etc.) via remote access by using a computer (Saklani, 2020).
3. **Mobile Access to Digital Library Resources**: - Most of the library resource providers, such as EBSCO, Ref Works Westlaw, up-to-date, Science Direct, Clinical Key, etc. have mobile apps or mobile sites that can provide more wired users (Saklani, 2020). Accessibility of DLRs also takes place by using Internet services as majority of students, researchers and academics prefer open access resources and databases, which are freely available and have far less financial and legal repercussions than subscription-based resources. Information resources in Open access can be accessed at any time and in a convenient way as noted by (Bala, Bansal & Sharma, 2018; Alphonce & Mwantimwa, 2019). This portrays that most of the DLRs are access through scholarly journal based on subscriptions or licenses.

In developed countries, for example, United State of America (USA) Pew Research Center's Internet / Broadband Fact Sheet (2019) conducted a study which found that about three-quarter of university undergraduates in the United States get access to digital information resources through broadband Internet at home. And students who live in suburban towns whose income are less than $30,000 a year uses the Internet less than those who live in cities and that earn more. Minorities, low-income earners, and people living in rural areas have the least access to broadband internet (56-63 percent). This indicated that urban areas have more access to digital information resources than suburban areas.

In Africa, Akuffo & Budu (2019) conducted a study focusing on students' access and utilized digital information resources. The study discovered that students have adequate computer skills which facilitate easy access to DLRs for academic purposes. However, there are some constraint that hinders the effective utilization of digital information resources such as poor internet connection and power supply, lack information searching skills as a result of irregular training. These factors grossly affect the student accessibility to digital information resources.

In Nigeria, research revealed that students and academic staff have different access points to digital library resources (such as e-libraries, information centers, smart phones and other devices). For example, a study conducted by Bamidele, Opeyemi, Odunola & Oluwafemi (2018) conducted research on electronic resources as a panacea for research output of academic staff in the context of Nigerian university. The findings revealed that students, academics and researchers access digital library resources at their university campus in their offices, off campus, and libraries as well as computer laboratories. Other findings were that access to these digital information resources are made possible through university libraries which

have subscribed to several digital information resources access point and databases. Moreover, this assertion corroborates with Odunlade (2017) which asserted out that there is high level of accessibility of digital information resources in most of the Nigerian high institution of learning but there is no effective utilization of the resources.

Similarly, Anyim (2018) carried out research with a focus on relevance of digital information resources and improvement of access for effective distance learning and continuing education program. The study found that enhancing access and utilization of digital information resources is based on regular facilitation of information literacy skills training for users; provision of online instruction or user guidelines on how digital information resources could be accessed. the study also found that displaying online resources on the institutional portal and also creation of user-friendly interfaces so as to enable people with less ICT skills to make use of it without hitches enhanced access and utilization of digital information resources as well.

Nevertheless, Song & Song (2017) carried out a study on the accessibility and utilization of digital information resources for research development of postgraduate students at Federal University Dutse. The study revealed that very few respondents rated that they access digital information resources from the e-library and the university e-library network but there is a very high digital information literacy (DIL) skills among the postgraduate students who can easily access the needed information from digital information resources. The study further revealed that digital information resources facilitate faster and easy access to relevant information, increase richness and updated information of work thereby promoting research productivity. The same study also revealed that the relationship between utilization of digital library resources and enhancements of research activities is positive and the study concludes that digital information resources is necessary for postgraduate students' research activities. Similarly, Makinde, Aba & Ugah (2017) carried out a study on accessibility and utilization of digital information resources by fisheries undergraduate students' in university libraries in North-central, Nigeria. The findings of the study revealed that digital library resources were available but level of accessibility and utilization were generally low. Most of the undergraduate students were constrained by inadequate professional digital library staff to facilitate the smooth service delivery to Library users, outdated and irrelevant information resources from their databases and waste of time when searching for relevant information resources.

In total, empirical literatures from within Nigeria and abroad showed that students and other users have access to DLRs from different access points. However, they need information literacy skills to complement effective that utilization. With this, librarians should fill this gap with sensitization training on how users can access DLRs in their academic endeavors.

Methods

Quantitative research method was employed and survey research design was adopted for the study. The targeted population was 14143, which comprised all the undergraduate students of universities in Yobe state; the universities of the study

area include Yobe State University Damaturu, and Federal University Gashua. Proportionate stratified random sampling was employed to guide the study. Questionnaire was used as the instrument for data collection and the data collected was analyzed using descriptive statistics.

Results

A total of 384 questionnaires were distributed by the researcher to the targeted respondents under study. Out of the total number of questionnaires distributed, 324 were duly filled and returned, resulting in a response rate of 82.5% while the remaining 60 with 17.5 % of the questionnaires were not returned.

RQ 1: Level of Accessibility to Digital Library Resources among Undergraduate Students of the Universities under Study

The respondents were asked to indicate the level of accessibility to digital library resources among undergraduate students of the universities under study. Therefore, Table 1 below showed the responses along with the mean scores and standard deviations of the respondents. Level of accessibility of the digital library resources were solicited using the following measurement scale where VIA = very inaccessible 1. I = inaccessible 2. UD = Undecided 3. A = Accessible 4.V = Very Accessible. As shown in Table 4.4.5.

Table 1: Opinions of the Respondents on the level of accessibility to Digital Library Resources among Undergraduate Students of the Universities under Study (N=324)

	VIA		IA		UD		A		VA		Mean	STD
Items	F	%	F	%	F	%	F	%	F	%		
E-journal articles	51	15.7	45	13.9	16	4.9	160	49.4	52	16.0	3.36	1.33
E-books	47	14.5	65	20.1	0	0	136	42.0	76	23.5	3.40	1.41
E-databases	81	25.0	108	33.3	27	8.3	54	16.7	54	16.7	2.58	1.50
E-projects	108	33.3	81	25.0	27	8.3	54	16.7	54	16.7	1.58	1.86
E-theses & Dissertations	54	16.7	216	66.7	0	0	27	8.3	27	8.3	1.67	1.75
E-Newspaper	52	16.0	62	19.1	0	0	163	50.3	47	14.5	3.28	1.36
E-Magazines	135	41.7	162	50.0	0	0	27	8.3	0	0	1.75	1.01
E-conference proceedings	162	50.0	135	41.7	0	0	27	8.3	0	0	1.75	1.01

E-references materials such as												
Online dictionaries	58	17.9	55	17.0	12	6.5	151	46.6	39	12.0	3.18	1.34
Online encyclopaedia	108	33.3	135	41.7	27	8.3	54	16.7	0	0	1.75	1.01
Online maps and atlases	81	25.0	108	33.3	27	8.3	81	25.0	27	8.3	1.58	.95
Online abstracts and indexes	108	33.3	135	41.7	0	0	54	16.7	27	8.3	1.67	1.02
CUMULATIVE MEAN											**2.30**	

The data presented in Table 1 indicated the twelve (12) items responses of the respondents on the level of accessibility to Digital Library Resources among Undergraduate Students of the Universities in Yobe state on the midpoint of the mean value of 3.0 and above indicated that the accessibility while below 3.0 indicated not accessible and the standard deviation scores for all the items clustering indicated homogeneous in their responses. A journal article was the first item listed in the above table and the data indicated accessibility with a mean of 3.36 and a standard deviation of 1.33. Also, e-books were found to be accessible with a mean of 3.40 and a standard deviation of 1.41. Conversely, e-databases, the result indicated that is not accessible with a mean deviation of 2.58 and a standard of 1.50. Similarly, e-projects and e-theses and dissertation were found inaccessible with a mean deviation of 1.58, 1.67 and standard deviation of 1.86 and 1.75 respectively. For e-newspaper, the data recorded that e-newspaper was accessible with a mean deviation of 3.28 and standard deviation of 1.36. For e-magazines and e-conference proceedings, the data indicated that was not accessible with a mean deviation of 1.75 and standard deviation of 1.01. For online reference materials, online dictionary was the first item listed where the data indicated that was accessible to majority of the respondents with a mean deviation of 3.18 and standard deviation of 1.34. Other online reference materials like online encyclopedia, online maps and atlases and online abstracts and indexes were inaccessible with a mean deviation of 1.75, 1.58 and 1.67 and 1.67 and standard deviations of 1.01, 1.19 and 1.02 respectively. The findings indicated that 2.30 was the grand mean which showed that the information resources were inaccessible.

From the above data, it can be concluded that the accessibility to digital library resources to undergraduate in the university libraries in Yobe state were limited to e-journal articles, e-books, e-newspapers and online dictionaries. However, other important digital library resources like e-databases, e-project, e-theses & dissertations, e-magazines and e-conference proceedings were not

accessible by the students. Others include online maps and atlases, online encyclopedias and online abstracts and indexes were also not accessed. This indicated that only few digital information resources were accessible to the undergraduate student of the university libraries in Yobe state such as e-journals, e-books and among others. In order to achieve an effective accessibility of the digital library resources, the university libraries should embark on awareness and sensitization of the information resources that were not accessible by the undergraduate student.

RQ 2: Challenges faced by Undergraduate Students in Accessing Digital Library Resources in the Universities under the Study

The study asked the challenges faced by undergraduate students in accessing digital library resources in the universities under the study as shown in the Table below.

Table 2: Opinions of the Respondents on the Challenges faced by Undergraduate Students in Accessing Digital Library Resources in the Universities under the Study (N=324)

SD= strongly disagree; **D**= Disagree; **UD**= Undecided; **A**= Agree; **SA**= strongly agree; **STD**= Standard deviation, **F**= Frequency

Items	**SD**		**D**		**UD**		**A**		**SA**		**Mean**	**STD**
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**		
Lack of awareness of digital library resources	27	8.3	54	16.7	27	8.3	135	41.7	81	25.0	3.58	1.26
Poor network connectivity and low bandwidth	54	16.7	81	25.0	0	0	135	41.7	29	16.7	3.17	1.41
Slowness of Network	81	25.0	54	16.7	27	8.3	54	16.7	108	33.3	3.17	1.62
In adequate computer facilities	108	33.3	27	8.3	54	16.7	81	25.0	54	16.7	2.83	1.14
Constant breakdown of digital library facilities	108	33.3	27	8.3	54	16.7	81	25.0	54	16.7	2.83	1.14
Staff indifferent	108	33.3	81	25.0	27	8.3	54	16.7	54	16.7	2.58	1.50

attitude												
Lack of qualified staff	54	16.7	108	33.3	54	16.7	81	25.0	27	8.3	2.75	1.24
Poor enabling environment	81	25.0	81	25.0	81	25.0	81	25.0	81	25.0	3.00	1.58
Lack of workable policy	54	16.7	54	16.7	27	8.3	162	50.0	27	8.3	3.17	1.28
										Grand mean	**3.00**	

The data presented in Table 2 recorded the challenges faced by undergraduate students in accessing digital library resources in the universities under the study on the midpoint of the mean value of 3.0 and above indicated that there were challenges faced by undergraduate students in accessing digital library resources while below 3.0 indicated not challenges. Lack of awareness of digital library resources, poor network connectivity and low bandwidth and slowness of network with means deviation of 3.58 and 3.17 with a clustering standard deviation of 1.26 and 1.24 respectively. However, in adequate computer facilities, constant breakdown of digital library facilities and staff indifferent attitude; majority of the respondents indicated their disagreement with means deviation of 2.83 and 2.58 with clustering standard deviation of 1.14 and 1.50. Also, lack of qualified staff, majority of the respondents disagreed with a mean deviation of 2.58 and a standard deviation of 1.50. Poor enabling environment and lack of workable policy; majority of the respondents indicated their disagreement with means deviation of 3.00 and 3.17 with clustering standard deviation of 1.58 and 1.28. The grand mean for the above table was 3.00 which showed that there were challenges in access and use of digital library resources.

From the data in the table above, it revealed that lack of awareness of digital library resources, poor network connectivity and low bandwidth, slowness of network, poor enabling environment and lack of workable policy were the major challenges affecting the use of digital library resources by the undergraduate students in the study area. However, in adequate computer facilities, constant breakdown of digital library facilities, staff indifferent attitude and lack of qualified staff are not been considered as the challenges affecting the utilization of digital resources by the undergraduate students in the study area. This implied that the challenges delimiting the undergraduate student to use the digital information resources include lack of awareness of digital library resources, poor network connectivity and low bandwidth, slowness of network, poor enabling environment and lack of workable policy. However, the undergraduate students attested that there are adequate computer facilities, no breakdown of digital library facilities, staff indifferent attitude and lack of qualified staff. Base on the above findings, the university libraries under study should provide an effective network connectivity,

high speed bandwidth, good enabling environment in order to achieve an effective utilization of the digital library resources.

Discussion

1. The finding indicated that the accessible digital library resources to undergraduate in the university libraries in Yobe state were limited to e-journal articles, e-books, e-newspapers and online dictionaries. While other important digital library resources like e-databases, e-project, e-theses & dissertations, e-magazines and e-conference proceedings were not accessed by the students. Others include online maps and atlases; online encyclopedia and online abstracts and indexes were also not accessed. Similarly, to the finding of this study, Anyim (2018) also expressed a similar sentiment that postgraduate students accessed electronic books (e-books), electronic journals (e-journal), electronic indexes, digital reference materials, online databases, and other e-collection for satisfy their information needs. The finding implied that the university libraries should create awareness on the information resources that were accessed by the undergraduate students.
2. The finding of the study revealed that lack of awareness of digital library resources, poor network connectivity and low bandwidth, slowness of network, poor enabling environment and lack of workable policy were the major challenges affecting the use of digital library resources by the undergraduate students in the study area. However, in adequate computer facilities, constant breakdown of digital library facilities, staff in-different attitude and lack of qualified staff are not considered as the challenges affecting the utilization of digital resources by the undergraduate students in universities of Yobe state. Similar with the finding of the study, Adeleke and Nwalo (2017) found that ineffective use of digital library resources by postgraduate students at the University of Ibadan occurred due to factors which include interrupted power supply, speed and capacity of computers, non-possession of requisite IT skills and problems accessing the internet. This finding is in agreement with those of Iroeze, James, Ngozi and Opara (2018) who found that online information resources are available but are not accessible due to poor network connections and power outrage. Contrary to the finding of this study Joshua & King (2020) found that one of the issues facing academic libraries is the collection development policies of digital library resources which include lack of subscription to the required databases, license management, maintenance and archiving

Conclusion

From the findings of this study, it can be concluded that there is poor accessibility of digital library resources. It can also be concluded that challenges faced by undergraduate students were poor internet connectivity, low bandwidth, poor

enabling environment and lack of workable policy were the major challenges affecting the use of digital library resources by the undergraduate students

Recommendations

Based on the findings of this study, the following recommendations were suggested.

1. The university libraries should sensitized the undergraduate students during orientation programmes on the availability of new digital library resources acquired by the digital libraries or an increase of new databases for users of the library. This will effectively enhance the level of accessibility of the digital library resources.
2. The university management should provide internet connections in their digital libraries. The bandwidth for Internet connectivity should be upgraded so as to improve the speed of accessing information resources from the Internet.

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Climate Change and Smart Technologies: Information Access and Collboration Among Farmers in Northern Nigeria as Pre- Requsite

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Abstract
This paper is on climate change, and smart technologies and the role of information access and collaboration. The focus is on how best, farmers could have access to agricultural information which includes among others weather and climate information through smart technologies. The objectives are to examine whether farmers have access to information pertaining to weather, climatic change and agricultural information through smart technologies. To evaluate the level of usage of that information so as to enable farmers have sustainable agricultural productivity, became resilient to climate change and to reduce greenhouse emission. A total of 150 household were randomly selected for qualitative survey and 100 were purposively sampled. This is because the respondents were scattered across the state senatorial district. The researcher categorised purposefully the respondent in to Agricultural Development Projects (ADP) zones of Ajiwa, Dutsinma and Funtua zones. Secondary data was collected through document reviews. The findings of the study revealed that members of farmers' association were aware and they have access to information and have been utilizing information through smart technologies. While non-members of the farmers association claimed ignorance about weather, climate and various types of agricultural information, which may be due to illiteracy, poverty and administrative bottlenecks. The paper recommended that a structured and well planned participatory approach toward agriculture is needed by all stake holders, provision of adequate and timely information is paramount and indigenous knowledge should be uploaded in the inter-Net for semi-literate farmers to read, utilise and inform others.

Keywords: Information Access, Climate, Collaboration, Smart Technologies, Weather

Introduction

The United Nation frame work and convention on climate change (2023) define climate change as a change in climate, which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere, and in addition to natural climate viability, observed over comparable period of time. Changes in temperature and rainfall are likely to result in spatial shift in patterns of agriculture and in crop yields, which may have a considerable socio-economic impacts on the society (Yusuf, 2014).

FAO (2014) estimated that food production must increase by at least 60 percent to respond to the demand of the 9 billion people that are expected to inhabit the planet by 2050. Given that one in eight people are currently food insecure, ensuring global food security over the next decades will be essential. In meeting this challenge, there is an opportunity to create sustainable economic growth in rural areas of developing countries where food security and poverty are most prevalent. Efforts to reduce food insecurity must include building the resilience of rural communities to shocks and strengthening their adaptive capacity to cope with increased variability and slow onset changes. The agricultural sectors (crops, livestock, forestry, fisheries) must therefore transform themselves in order to feed a growing global population and provide the basis for economic growth and poverty reduction. This transformation must be accomplished without hindering the natural resource base, hence, the need to use smart technologies in disseminating information resources to farmers.

FAO has recognized that for agriculture to feed the world in a way that can ensure sustainable rural development, it must become 'climate smart '. Climate-smart agriculture (CSA), as defined and presented by FAO at The Hague Conference on Agriculture, Food Security and Climate Change in 2010 is an approach to developing the technical, policy and investment conditions to achieve sustainable agricultural development for food security under climate change. It contributes to the achievement of national food security and development goals with three objectives: The magnitude, immediacy and broad scope of the effects of climate change on agricultural systems create a compelling need to ensure their comprehensive integration into national agricultural planning, investments and programs. The CSA approach is designed to identify and operationalize sustainable agricultural development explicitly integrating climate change as a major parameter.

The most general concept of climate change therefore, is a 'change in the statistical properties of the climate system when considered over a long period of time, regardless of the cause'. Accordingly, fluctuations over periods shorter than a few decades do not represent climate change. The term is, sometimes, used to refer specifically to climate change caused by human activity, as opposed to changes in climate that may have resulted as part of the earth's natural processes. In this respect, especially in the context of environmental policy, the term climate change has become synonymous with anthropogenic global warming. However, scientifically, global warming refers to surface temperature increases while climate change includes global warming and everything else that increasing greenhouse gas levels will affect. Weather and climate characteristic of any place on earth determine the type of crop that are grown for food, animal that are reared and

indeed shape the way of life of the people and affect their socio- economic activities. Normal weather and climate conditions are associated with good yield and positive economic impact. Timely and reliable information on weather and climate are very important to all weather sensitive sectors of the economy. Such information is use for strategic planning and for climate-smart decision and practices which could bring about reduction of losses from adverse weather, minimize disasters and maximize output. (Sirika, 2019).

Causes of Climate Change and how it affect Agriculture

Generally, climate scientists agree that the main cause of the current global warming trend is human expansion of the "greenhouse effect" warming that result when the atmosphere traps heat radiating from Earth toward space. In practical terms, the rate at which energy is received from the sun and the rate at which it is lost to space determine the equilibrium temperature and climate of the Earth. This energy is distributed around the globe by winds, ocean currents, and other mechanisms to affect the climates of different regions. Factors that can shape climate are called climate forcing or "forcing mechanisms". These include processes such as variations in solar radiation, variations in the Earth's orbit, changes in greenhouse gas concentrations etc. According to Ibrahim (2013), there are a variety of climate change feedbacks that can either magnify or shrink the initial forcing. Some parts of the climate system, such as the oceans and ice caps, respond slowly in reaction to climate forcing, while others respond more quickly. Forcing mechanisms can be either "internal" or "external". Internal forcing mechanisms are natural processes within the climate system itself (e.g., the thermohaline circulation). External forcing mechanisms can be either natural (e.g., changes in solar output) or anthropogenic (e.g., increased emissions of greenhouse gases). Whether the initial forcing mechanism is internal or external, the response of the climate system might be fast (e.g., a sudden cooling due to airborne volcanic ash reflecting sunlight), slow (e.g. thermal expansion of warming ocean water), or a combination (e.g., sudden loss of albedo in the arctic ocean as sea ice melts, followed by more gradual thermal expansion of the water). Therefore, the climate system can respond abruptly, but the full response to forcing mechanisms might not be fully developed for centuries or even longer (Gani, 2010).About 80% percent of world agriculture is rain fed providing food and job to millions of people especially in rural Asia and Africa. Climate change has brought about change in rainfall, evaporation, runoff, and soil moisture level. Where drought is prolonged, resultant effects are crop failures of peasant farmers leading to disruption in the economic, political and the social lives of the farmers. Agriculture generally depend on the availability of water. Change in the amount of rainfall or its distribution play a significant role in all aspects of agriculture. The occurrence of moisture during the flowering, pollination, and grain-filling is harmful to most crops and particularly so; to corn, soybean and wheat. Increased evaporation from the soil and accelerated transpiration in the plants themselves will cause moisture stress (National Geography, 2019) On livestock farming system, Spatial and geographical distribution is characterised by resources scarcity. Water is a significant resources for pastoralist while grazing land is equally important resources that attracts

herders, these two resources determine, to the large extent, the livelihoods of pastoralists. Unfortunately, the two are severally affected by the impact of climate change which accordant to Anderson and Hoffman (2011) have a greater impact on rangeland production than overgrazing in dry land area

Information Access and Utilisation as a way of Mitigating Climate Change

Information is an indispensable factor for promoting the development of any society. The so-called developed nations are where they are today, by virtue of information generation and dissemination to their people; it is the raw material for making decisions, for creating knowledge and fuelling the modern organization (Ibrahim & Lawal, 2012).The level of awareness of climate change implication is still low in developing countries (Nzes and Eboh,2010). Farmers ability to effectively respond to climate changr challenges is determined by the level of knowledge and the quality of information available to them and how such information can be assessed (Ozor and Nnaji,2011). Monica et al (2014) reported that only access to weather information showed positive significant effects on farmers' perceptions of climate variability among the variable of farm size, credit, farming experience and age of the farmer. This implies that even if the climate is perceived to be changing, at local level availability of information plays a big role in informing farmers' perceptions, attitudes and practices with regard to the observed changes. This is in agreement with Patt *et al*. (2005), who indicated that of the 75% of farmers who reported receiving seasonal rainfall forecast, 57% reported changing their management practices in response.

Precise and timely information on the climate, combined with agro-advisory reduces uncertainty and improves farmer's decision making. For example, climate information on the total rainfall, the onset and end of the rainy season, or daily and weekly forecast across the rainy season, together with advice tailored to meet local needs, allows farmers to adjust farm management practices or purchase index-based insurance to protect assets. Delivery of timely and high quality agricultural weather information has become an important function of many state extension services. Appropriate climate information enhances small holder farmers' ability to mitigate the adverse effects of climate change, it is also argued that to avoid disastrous consequences, fundamental changes in agricultural operations should go hand in hand with changing climate. This is because, timely updated information of weather and climate scenarios help farmers to adjust their farming plans in accordance with expected weather pattern (FMARD/NAERLS, 2017)

Millions of small-scale farmers in low-income countries are trapped in poverty because they are unable to take the risks associated with investments in improved agricultural technologies and practise; a tendency exacerbated by climate change and increased variability. Establishing well-designed information schemes (National Geography, 2019) not only enhances resilience when climatic shocks occur, the presence of an indigenous knowledge can help farmers overcome the risk of investing in climate-smart technologies. To avert more serious hunger crises in this three senatorial districts and indeed in Nigeria, we need to build a stronger food system for smaller holder farmers. They are often the anchors for food security,

system and barriers to entering effectively in the dissemination of commercial information.

Another way of mitigating the climate change is to invest heavily on agricultural research and development. This will help in the provision of the required scientific tool needed to adapt to the changing weather patterns and build resilient food systems that could lead to the production of nutritional food foe the communities as well as provide a more sustainable economic stability.

Providing Climate Information Services and Agro-Advisory Precise and timely information on the climate, combined with agro-advisory reduces uncertainty and improves farmer's decision making. For example, climate information on the total rainfall, the onset and end of the rainy season, or daily and weekly forecast across the rainy season, together with advice tailored to meet local needs, allows farmers to adjust farm management practices or purchase index-based insurance to protect assets.

Collaboration

This is the process whereby two or more (often groups), of professionals (farmers) work together through idea sharing and thinking to accomplish a common goal or target. In this scenario, farmers come together in an association to think of a way out in a certain quagmire so as to achieve their common objective of achieving self-sufficiency, food security and resilient to weather. Adetoro (2021) defined collaboration as a means whereby a group of people come together and contribute their expertise for the benefit of a shared objective, project, or mission. Collaboration is a process of group work where (people) farmers learned skills, valued the activity of learned colleagues, makes teamwork successful and share their responsibilities; this would be done in order to enhance the process of information transfer among a particular group. IFAD 2021 reported that Climate change Adaptation and Agribusiness support programme has promoted farmer to farmer extension service delivery using lead farmers. This is commendable as several indirect beneficiaries were also reached.

Farmers need to collaborate to help themselves learned from each other. They need to collaborate in order help solve a problem; they also collaborate to make their activities more efficient which will eventually leads to higher retention rates or bumper harvest. This will at the end of the day boost their morale across their colleagues, brings them together as an organization, open up a new channels of communication and they are likely to be more successful.

Objectives

The main objectives of the study is to:

1. Identify the type of information farmers preferred
2. Examine whether they have access to climate information and in what format
3. Examine the perception of farmers on climate change
4. Determined any climatic problem encountered by farmers
5. Investigate the best practice needed for adaptive climate change and resilient seedlings.

Method

The methodology employed for this study is the survey research method and a total of 150 household were purposefully randomly selected for data collection. Secondary data was collected through document reviews. The reason for selecting Katsina State was based on the fact that the State was created on 23rd September, 1987 out of the former Kaduna State. It is bordered to the South by Kaduna State, to the North by Niger Republic, to the West by Zamfara State and to the East by Jigawa and Kano States. It lies between Latitude 110 07' 49" to 130 22' 57"N and Longitude between 060 52' 03" and 090 02' 40"E and covers an area of about 23,983 square kilometers with total population of about 5, 8015 million based on the 2006 census figures (Makama, 2007). Katsina, an agrarian state with more than 800,000 farming families and cultivating more than 1.5 million hectares of farmlands is among the largest producers of cotton and maize in the country. Other major crops grown in the state include beans, guinea corn, millet, groundnut, sugarcane and vegetables. Potentials for the development of exportable agricultural products in which the state has comparative advantage include value addition in products like cotton, hides and skin, gum Arabic, sesame seeds and neem seeds. Government supports to agricultural sector include the provision of subsidized farm inputs, fertilizer, improved seeds, pesticides, extension services as well as micro-credits among others. Katsina senatorial district is characterised by drought and intermittent rain fall while Funtua zone is characterised by heavy rain fall but with lots of gully erosion. The instrument for data collection was the interview, though interpreted in Hausa to aid responses (by Non-literate farmers).

Results

Demographic information of the respondents

S/N	Sex	Responses	Percentages
1	Male	101	81%
2	Females	49	19%
	Total	150	100%

Questions to the respondents

S/N	Questions	Responses	%
1	Do you have access to information?	Yes we have but not in written format. In most cases we got our information from colleagues and Radio	93%
2	What type of information are you provided with?	We got information on fertilizer only and it is only the literate among us that can read Newspapers and other forms of information from other sources. And also they belong to farmers association.	93%

3	Do you have access to timely weather information?	No, we seldom got this information unless you are engaged in irrigation and belong to any of the farmers Associations.But for those who belong to farmers association , only 8% received that information.	94%
4	What is your perception about climate change and do you use any of the ICT facilities in accessing information on climate change?	All the interviewed respondents agreed that farmers perceive Climate change to be affecting them. We only contact our colleagues to access weather information. Whenever we have meetings of our association, we used to share information.	92%
6	Do you engaged in any collaborative efforts with colleagues?	Yes we do and that is where we used to share some vital information with them, particularly those that belonged to association.	100%
7	What are the causes of climate change?	From experiences climate change occur as a result of changes in rainfall patterns, floods, dry spells, and prolonged droughts coupled with increased temperatures, felling of trees, bush burning,industrial revolution and global warming among others.	92%
8	What are the effects of climate change?	High change in weather (air), soil erosion, intermittent rain fall and arrival of so many pest (hydrological, meteorological or climatologically). Overall decline in production and it affect our economy.	93%
9	Do you encounter any problem with regards to climatic change in your farm?	Yes, lack of enough rain fall, low yields, soil erosion and degradation and reduction in economic output.	93%
10	Are you provided with any palliatives as a result of draught, erosion and other climatic challenges?	Never by government and where you lodged complains it take time before you are considered and by then you have heard the effect.	93%
11	How best could government support you?	To provide us with timely information about weather, control of pest, market information(commercial information), all these through Radio programmes, Town criers and provide us with cheap and domesticated Android phones.	94%

12	How do you think government can provide solutions to these challenges.	Aggressive attitudinal re-orientation, Remediation of areas affected by erosion, effective economic empowerment, Policy on ranging and livestock rearing etc.	93%

From the data Table obtained on demographic information about the respondents, the majority were males (81%), this male dominance further reflects the religious and cultural backgrounds of the community while the females constitute only 19%. Females accounts for this percentages because of the nature of the area of coverage, as majority of them are on Purdah and only few of them do engaged in farming and the rest lost their husbands and no body to take care of them, except to fully engage in farming. this finding confirmed the notion that farming was predominantly for male whereas the female were known for selling the agricultural produce and processing it. The result is in line with FAO's (2011) submission on rural employment and farm labour project; it was reported that with regard to farming, men proved more productive than their female counterparts.

Discussion

Farmer's perception on climate change

Past experience influences farmers selectivity of perception, all the interviewed respondents (93%) agreed that they perceive climate change to be affecting their production in Katsina State, this can be explain further by looking at our perception to be relative rather than absolute.. The result was based on practical experiences and the realities farmers faced in their daily interaction with the environment as they carry out farming activities. Their views were corroborated with Yusuf (2018) where he stated that as a result of climate change farmers faced low output in their farming activities. However the major effects of climate change perceived to be high by the farmers in the area were irregular rainfall and unpredictable weather harshness. Farmers'decisions to adopt adaptation technologies generally depend on farmers' perception of the variability in the climatic condition

Access to information

All the 83% respondents indicated that they do not have access to information but through friends (colleagues) and the rest who belong to farmers associations and are literate got their information on weather/climate through print and electronic means. This indicated majority of the farmers were illiterate, they cannot read or access the information needed and therefore could not access written information and the literacy level of the farmer portent great prospect for increase production, especially with regard to taking inform farm decision, innovativeness and adoption of technologies in the sector. This finding is also in line with Asadu et al, (2018) who indicate that information on climate change were sourced mostly from neighbours or friend and personal experience and according to his finding conventional extension agent are expected to be one of the major sources of information for the farmers but due to inadequate number of extension agents its affect creating awareness and building capability of farmers for climate change adaptation. Accordant to Adebayo et al, 2012 in a study conducted in Adamawa State, Nigeria;

it was found that very few farmers were aware of the impact of climate change and they, therefore, used tolerant varieties, early maturing seeds, alteration of planting schedule and crop diversification to mitigate the effect on crop production.It is important to note that access to weather information showed positive significant effects on farmers' perceptions of climate variability. IFAD, 2021 reported that all the seventeen participating LGAs on Climate change adaptation and agribusiness support programme were reached on climate information services. This service is the flagship formed a strong partnership with NIMET to drive this activity from 2016 to 2021. It was preceded by a very successful awareness campaign on climate change. Evidence during field visits throughout the project area shows that awareness on climate change (called ***chanjin Yanayi*** in the local Hausa language) is very high among the rural small holder farmers and the population at large. The rate of uptake of climate information is high across all the participating states and CDAs, and farmers look forward to the yearly downscaled seasonal rainfall prediction information and outreach to plan their planting seasons and prepare for climate risks especially dry spells during the growing season. Testimonies from CASP farmers brought tremendous benefits to NIMET and earned the organization international recognition and grants for supporting small-holder farmers. As a result of the success of the partnership with CASP, this partnership is being extended to other IFAD projects - VCDP and LIFE-ND. 99. Feedbacks from the smallholders' farmers suggest that the annual seasonal rainfall prediction which is downscaled, and shared and discussed with farmers in native language contributes significantly to improving their adaptive capacity and resilience. Most importantly, this annual service has enabled them to be more acquainted with the rainfall onset and cessation dates as well as possibility of dry spell to develop crop calendar and thus mainstream climate information-driven smallholder cropping. There are testimonies of farmers who staved off dry spell by preparing ahead of time based on prior information received.

Type of information received

On the type of information farmers received either from Government or through ICT and print materials, majority of them 83% revealed that since they are not literate and do not belong to any association they only have access to fertilizer information from their wards or from their colleagues. Apparently, they do not have access to information pertaining weather, climate and other scientific information. This is a big challenge to them. This is because before they got the information particularly on climate change the damage has been done. They do not have and do not know how to use Android phones since they are not manufactured to take care illiterates. More so, there are no adequate extension workers to translate the research findings to the farmers. Extension is a system that should facilitate access to information, the organization and all other actors involved in the dissemination of knowledge, information and technologies to farmers. This will facilitate their interaction with other partners in order to assist farmers to develop themselves. I

Whether they encounter any of the climate change and its effect on them

Respondents were asked on whether they encounter any of the climatic changes in which they answer in the affirmative. 92% of all the respondents affirmed that face one form of climate change or the other. And the consequences of the climate changes are enormous among which are; High change in weather (air), soil erosion, intermittent rain fall and arrival of so many pest (hydrological, meteorological or climatologically). Overall decline in production and it affect our economy. Lack of enough rain fall, low yields, soil erosion and degradation and reduction in economic output are some of consequences and this is in conformity with Ibrahim Y (2018) who reported that katsina state is exposed to the danger of climate change. It is highly susceptible to the impending threats because of its proximity to the fringes of Sahara desert and the implication of climate change to the state include treat to crop and livestock farming considering the strong nexus between climate change and development the state is highly at the risk in the area of food security, poverty and income generation.. When asked about government intervention or palliatives given to them, majority were of the opinion that nothing was given to them.

Remedy to the problems

Respondents were also asked to provide solutions to the problem encountered as a result of climatic changes and whether they can become resilient to it. They advice that Aggressive attitudinal re-orientation, Remediation of areas affected by erosion, effective economic empowerment, Policy on ranging and livestock rearing, establishment of RUGA, provision of high growth yields and resilient crops are better solutions to climate changes. However Adaptation to climate change necessitates that farmer should first perceive its diverse instrumentations and manifestations, and information access will help in decision making after which they can then recognize suitable adaptations and practice them (Maddison, 2006).

Conclusion and Recommendations

Precise and timely information on the climate, combined with agro-advisory reduces uncertainty and improves farmer's decision making. For example, climate information on the total rainfall, the onset and end of the rainy season, or daily and weekly forecast across the rainy season, together with advice tailored to meet local needs, allows farmers to adjust farm management practices. Radio programmes and jingles, to develop and disseminate downscaled climate information services (CIS), and to raise capacity of partners to do longer-term analysis and convey more actionable information for farmers is necessary to curve the effects. Finally elsewhere (like in India) agro-advisories were disseminated to farmers in over 60 villages through voice messages on mobile phones with inputs taken from metrological departments, scientists, input dealers and farmers. Much of this work focuses on Farmers associations and women's groups, to empower women to participate in farming decision-making. So in Nigeria and Katsina State in particular, it's recommended by the study to do the same so as to empower and disseminate information to the peasant farmers.

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Innovating Academic Library Services Through the Adoption of Artificial Intelligence Technologies in Tertiary Institutions: The Nigeria Experience

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Abstract
Artificial Intelligence (AI) influence is everywhere these days, from classrooms and workplaces to even libraries. It's being used to improve library services and make sure everyone gets the support they need. However, literature has not well documented the ways academic libraries deliver their services innovatively through AI in developing countries. This paper explores AI technologies and their innovative approach to academic libraries. Also, describes the concepts, characteristics, and a brief history of AI. Moreover, the paper highlights the usage of AI in academic libraries. The study provides a few case studies in academic libraries that adopted AI. Furthermore, the paper explains the emerging issues of AI adoption. It was concluded that AI has become one of the principal driving forces and AI adoption must flourish.

Keywords: Artificial Intelligence; Academic library, Innovation; Library services, Nigeria

Introduction

The wave of technological advancement and globalisation has significantly impacted various sectors of society, including the field of librarianship. Today, technology, especially Artificial Intelligence (AI), is integral to enhancing academic library services, thereby supporting learning, research, and teaching within the educational sector. This trend is increasingly evident in advanced countries, where

technology is now considered essential for the effective and efficient functioning of libraries and the broader progression of education.

In recent decades, AI has become pivotal in transforming our world and influencing how we think, act, and make decisions. AI is defined as the ability of a digital computer, or a computer-controlled machine or software, to mimic the intellectual capabilities of intelligent beings, like humans. Scholars describe AI as the creation and development of fully conscious, intelligent, computer-based entities (Sheikh et al., 2023). Rajaraman (2014) defines AI as the science and engineering of building intelligent machines. Similarly, Zhang (2024) described AI as the application of machine learning and other techniques in research that offers opportunities for libraries to expand their services

AI aims to inspire, simplify, and manage tasks while understanding and processing human language. According to Copeland (2015), AI's primary goals include reasoning, discovery, generalisation, and natural language processing. AI has sparked considerable interest across various fields, including information science, computer science, mathematics, psychology, linguistics, and librarianship. In Library and Information Science (LIS), expert systems are the most notable application of AI.

The integration of intelligent systems into libraries began in the 1990s, utilising AI technologies to provide knowledge-based services to both library patrons and staff. Despite its complexity, AI aims to develop computer systems with human-like intelligence, significantly impacting the field of librarianship. Guliciuc et al. (2017) note that expert systems assist library professionals with basic operations, decision-making, and productivity improvement. Similarly, Massis (2018) argues that AI can operate independently of human intervention, fostering the development of intelligent libraries capable of performing tasks autonomously. Library could be described as a collection of resources organised by professionals to provide accessible information and promote learning, societal advancement, and entertainment. Libraries strive to serve all users, regardless of age, gender, or location, through various services and programs designed to meet information needs.

Modern 21st Century libraries serve as collaborative hubs that blend physical and digital resources, encouraging exploration and creation among students, teachers, and the community. The implementation of AI in libraries introduces innovation to many operations, improving subject indexing, reference services, database searching, document delivery, and material security. AI is one of the key technologies of the Fourth Industrial Revolution (4IR), alongside big data, robotics, blockchain, virtual/augmented reality, machine learning, the Internet of Things, drones, predictive maintenance, advanced analytics, robotic process automation, nanotechnology, and more. This study focuses specifically on AI's role in enhancing library services, contributing to the existing body of literature by addressing the gap in AI research within the field of librarianship in African countries.

Statement of Problem

Artificial Intelligence (AI) plays a crucial role in academic libraries, offering significant benefits such as reducing manual and repetitive tasks and minimizing errors and inconsistencies in data. However, despite the rapid expansion of AI in other fields, research connecting AI to librarianship remains limited (Amanda & Sandy, 2019). Additionally, literature indicates that only smaller universities in Nigeria have engaged with AI, making its presence in Nigerian academic libraries almost non-existent. This study is crucial for filling the gap in the literature on AI in librarianship and determining the current state of AI adoption in Nigerian academic libraries. The study aims to: trace the history of Artificial Intelligence; identify the areas within academic libraries where AI is utilised; examine the current status of AI technology adoption in Nigerian academic libraries; and identify emerging issues related to the adoption of AI by academic libraries in Nigeria.

Methods

The methodology involved conducting a comprehensive literature review to identify relevant papers on Artificial Intelligence. Search engines and databases such as SCOPUS, Science Direct, SAGE, ProQuest, DOAJ, and Google Scholar were utilized. The keywords and synonyms used included "artificial intelligence," "deep learning," "machine learning," "library," "education," "sustainability", "Nigeria" and "Africa" The search was refined to include only papers that (a) specifically focused on artificial intelligence and machine learning, (b) reported empirical research results, and (c) were conceptual papers significantly related to the present study. Additionally, reference lists from journals, online books, and conference proceedings were reviewed. Dissertations and theses were excluded.

Special efforts were made to ensure the selection of relevant papers from peer-reviewed, high-impact journals. References from included articles were examined to identify other potential studies missed in the initial search. This process resulted in a total of 62 papers meeting the eligibility criteria. The search was limited to a specific year range to gather current information despite AI not being a new concept. This approach ensured diverse perspectives from researchers across different countries and enriched the description of AI's innovative role in academic libraries.

History of Artificial Intelligence(AI)

Artificial Intelligence (AI) is not a novel concept; the algorithms in use today have been in existence for many decades (Stone et al., 2020). In 1950, Turing conducted the Turing Test, which aimed to discern whether a machine could mimic human behavior (Turing, 1950). The formal inception of AI occurred in late 1956 with a workshop held at the Dartmouth Summer Research Project on Artificial Intelligence (Haenlein & Kaplan, 2019; Friendly, 1974). Organized by four researchers—John McCarthy, Nathaniel Rochester, Marvin Minsky, and Claude Shannon—this two-month study involved ten participants. Their primary objective was to demonstrate that machines could precisely replicate all facets of learning and intelligence. Additionally, the workshop explored how machines could utilize language, create abstractions and concepts, solve problems typically associated with humans, and

enhance their capabilities (Kreatsoulas & Subramanian, 2019). Consequently, AI was conceptualized as the development of machines capable of exhibiting behaviors deemed intelligent when performed by humans.

The progression of AI has been steady over the decades. In the 1950s, research primarily focused on game playing, while the 1960s emphasised search algorithms and general problem-solving (Delipetrev et al., 2020; Cui & Shi, 2011). The 1970s witnessed exploration into natural language understanding and knowledge representation (Cui & Shi, 2011). The 1980s saw a period of stagnation known as the AI Winters, marked by reduced research funding (Álvarez-Machancoses & Fernández-Martínez, 2019). However, AI experienced a resurgence in the 1990s and early 2000s, achieving notable successes. The adoption of intelligent systems in libraries, replacing conventional systems, commenced in 1990.

Concept of Artificial Intelligence

Intelligence entails the capacity to grasp and apply suitable methodologies for problem-solving and goal achievement. Artificial Intelligence (AI) encompasses computer-operated robots designed to simulate human cognitive processes (Nwakunor, 2021). These robots, electronically controlled by computers, imitate human cognitive functions. AI technology facilitates machines in planning, learning, reasoning, problem-solving, mobility, and even demonstrating some level of inventiveness (Heath, 2018). It encompasses the programming and advancement of computers to execute tasks typically requiring human intellect, such as recognizing speech, interpreting visual data, translating languages, making decisions, communicating, and expressing emotions (Irizarry-Nones et al., 2017). Essentially, AI endeavors to imbue computers or machines with intelligence akin to humans to tackle intricate problems in a manner akin to human thought processes.

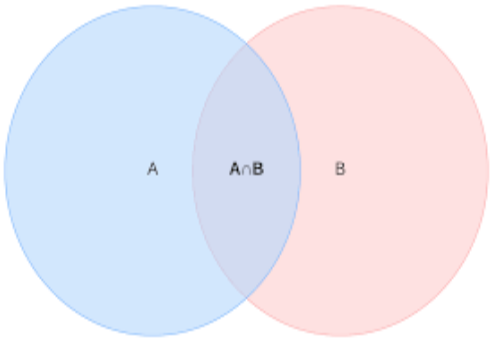
Characteristics of Artificial Intelligence

Artificial Intelligence (AI) and Robotics serve distinct purposes, although they are often confused. Many people question whether robotics is a subset of AI or if they are identical. Thus, it is important to clarify their differences.

Artificial Intelligence (AI) represents a sector within computer science dedicated to crafting computer programs capable of executing tasks traditionally associated with human intellect. AI algorithms are adept at tasks such as learning, perception, problem-solving, language comprehension, and logical deduction (Saleh et al., 2019). The field of AI is in constant evolution, with scholarly discourse often portraying AI as robots closely mirroring human characteristics.

Conversely, Robotics stands as a technological domain concerned with the design and operation of robotic systems. Robots are programmable devices capable of autonomously or semi-autonomously executing a sequence of actions. While not all robots possess artificial intelligence, there exists an overlap wherein AI and robotics intersect, resulting in the development of artificially intelligent robots.

A simple diagram can illustrate that AI is not synonymous with robots but shares certain attributes with them. The overlapping area between robotics and AI is referred to as Artificially Intelligent robots.



(Researchers self-designed, 2024)

Keys:

A- Robotics
B- Artificial Intelligences
AB- Artificial intelligence robotic

The following are characteristics of AI:

1. AI serves as a tool that enables people to rethink how we analyse data, integrate information, and utilise these insights to make better decisions (Bickley et al., 2024)
2. AI independently makes decisions, augmenting human intelligence, providing insights, and enhancing productivity.
3. AI possesses predictive and adaptive capabilities, using algorithms to identify patterns within vast amounts of data.
4. AI can perform tasks involving motion and perception.
5. AI continuously learns by using algorithms to create analytical models, learning to perform tasks through numerous rounds of trial and error(Galdorisi & Tangredi, 2024)

Application of AI in Academic Libraries' Operations

The advent of AI technology is a promising advancement for libraries, presenting a plethora of tools that can greatly benefit patron services, research endeavors, and educational support. AI holds considerable potential in various aspects of library and information center functions, encompassing tasks like descriptive cataloguing, technical services, collection development, subject indexing, reference assistance, database querying, and document retrieval. Integration of AI into library operations has the potential to elevate user satisfaction levels. Several research studies (Wheatley & Hervieux, 2019; Pinfield et al., 2017) have shed light on AI applications within library contexts, including the implementation of chatbots, document categorization, personalised services, text and data mining (TDM), intelligent learning platforms, and user exploration tools. The adoption of AI stands to enhance performance across diverse operational domains.

A. Application of Expert System jn Library

Intelligent library systems harness AI technologies to furnish knowledge-based services to library users and personnel alike. AI represents a multifaceted and expansive domain of inquiry, aspiring to develop computer systems capable of matching human intelligence, a prospect that carries profound implications for the field of librarianship (Asemi & Asemi, 2018). There have been endeavors to scrutinize research and developmental endeavors pertinent to librarianship, drawing insights from prominent frameworks of human intelligence. Through this examination, ten factors have been pinpointed as particularly pertinent to Expert Systems (ES), encompassing aspects like acquisition, automation, comprehension, memory management, metacognition, numerical prowess, reasoning, social adeptness, verbal acumen, and visual perception, all of which bear relevance to library and information science (Asemi et al., 2018).

Application of Expert System in Acquisition: The primary function entails obtaining pertinent library materials for inclusion in the library. This can be accomplished by both librarians and library users through the development of electronic collections. Various systems have been integrated for this purpose, such as the Monograph Selection Advisor, representing an initial endeavor in applying this emerging technology to build library collections. Additionally, the process emulates the item-by-item decision-making typically conducted by subject bibliographers when selecting monographs, utilising the expert system. However, it is imperative for the knowledge base to be sufficiently extensive and for the interface to be user-friendly to ensure that the library can effectively retrieve the desired information from the system.

B. Application of Expert Systems in Reference Services

The key functions within the reference section can be facilitated through the implementation of AI expert systems in reference services. According to Asemi et al. (2018) and Gujral et al. (2019), AI can be applied across various areas of library services as outlined below:

1. Online Reference Assistance (ORA): This essential service provided by reference librarians can leverage various technologies, including videotext-like databases, computer-assisted instruction modules, and knowledge-based systems. ORA encompasses directional transactions, such as inquiries regarding library locations, services, and policies.
2. Information Pointer: Reference librarians can effectively utilise computer systems to assist patrons in locating reference sources. The expert system guides users to relevant reference sources, functioning as a computer-assisted reference program rather than a Knowledge-Based System.
3. Research: Expert systems can be employed by reference librarians to teach students referencing skills or serve as a computerised aid for practicing reference librarians and information specialists.
4. PLEXUS: This tool facilitates information referral services for library users, particularly in public libraries. It incorporates knowledge about

the reference process, specific subject areas, reference sources, and library users.

5. ANSWERMAN: A knowledge-based system designed to assist users with reference questions related to agriculture topics. Utilising a series of menus, it helps narrow down the subject of questions and the type of tool needed. It can function either as a consultation system or as a front end to external databases and CD-ROM reference tools.
6. Chatbots: These automated systems can handle directional questions on a library website, provide alerts for due books, direct users to relevant library resources, or address simple information requests. Chatbots are already being deployed on various websites to address patron questions, provide directional guidance, and direct patrons to relevant resources. Introducing conversational systems in libraries and museums can enhance patron query resolution and improve accessibility.

C. Application of Expert System (ES) in Classification

A fundamental task within the technical services division of academic libraries involves classification and cataloging, which plays a crucial role in organising knowledge within libraries and information centers. The implementation of an Expert System proves particularly beneficial, especially in the realm of classification. Moreover, Expert Systems can also find application in the following domains:

1) Coal SORT: This tool functions as both a search and indexing tool, incorporating a frame-based semantic network and the necessary software to enable users to navigate through and highlight portions of the conceptual structure. The expert knowledge within the system primarily resides in the semantic network.
2) Environmental Pollution Expert (EP-X): EP-X shares similarities with Coal SORT in that both focus on improving the interface using a Knowledge-Based approach. EP-X's knowledge base consists of a hierarchical frame-based semantic network of concepts and a set of template patterns known as conceptual information.
3) BIOSIS: This tool serves as an aid for indexers, utilising its knowledge base. BIOSIS leverages the information contained in the titles of biological documents to assign categories, mimicking the process conducted by human indexers. The indexing languages provided are structured representations of information, offering significant advantages for AI applications.

D. Application of Expert System in Indexing: Expert systems contribute substantially to the indexing process of periodicals. Indexing an article in a periodical entails identifying concepts, translating them into verbal descriptions, and choosing controlled vocabulary terms that precisely convey these concepts. Automating the intellectual facets of indexing seeks to improve the consistency and caliber of indexing. Leveraging information furnished by indexers, these systems can autonomously identify suitable preferred terms and allocate pertinent

subdivisions. The system is capable of making suggestions and taking appropriate actions based on inference. An illustrative example is 'Med Index', which exemplifies an indexing system widely utilised in libraries for indexing activities.

E. Application of Pattern Recognition in Library Activities

In the contemporary age of the Internet and multimedia computing, along with the emergence of new classes of information systems applications, office workers are experiencing significant transformations. The proliferation of new applications such as digital libraries, multimedia systems, geographic information systems, collaborative computing, and electronic commerce has opened up vast opportunities for information researchers and practitioners alike.

F. Applications of Robotics in Academic Library Activities

The integration of electronic and print-based resources and services has posed significant spatial limitations for many libraries, particularly academic research libraries (Okpokwasilli, 2019). To address this issue, the Comprehensive Access to Printed Material (CAPM) initiative endeavors to develop a robotic scanning system that operates on-demand and in batches, enabling real-time browsing of printed material through a web interface. Users will engage with the CAPM system, prompting it to deploy a robot for retrieving the requested item. Subsequently, another robotic system will open the item and autonomously flip through its pages. Utilising existing scanners, optical character recognition (OCR) software, and indexing tools from the Digital Knowledge Centre, the CAPM system will not only facilitate the browsing of textual images but also enable searching and analyzing of full-text content derived from these images. Now, let's explore a few academic libraries that have implemented AI in their library operations.

Case Studies of AI from Academic Libraries in Nigeria

Table1: Nigerian University Libraries with Artificial Intelligence (AI) and Robotics Adoption

S/No	Name of Organisation	AI Functions
1	Lead City University Library	The university implemented an Artificial Intelligence powered book recommendation system to assist users with a selection of books to read. This can be achieved by using machine learning algorithms to analyze users' reading preferences and suggest books that match their interests.
2	Covenant University Library	This university implemented an AI-powered chatbot to provide information on library services and resources to its users. The chatbot, known as CULibrarian, serves as an interactive tool for addressing users' queries. It offers guidance on library policies and procedures, as well as aids in research inquiries.

3	University of Lagos, Nigeria	AI has been employed to enhance delivery operations through the introduction of robots.AI usage tagged Robo Scholar AI provides the data of people coming to the library every day, looking at the peak time that they come in, and the peak hour, they leave.
4	University of Nigeria, Nsukka	University implemented an AI-powered chatbot to provide library services to its users. The chatbot; called "Ask Ada," can answer users' questions, provide information on library resources, and assist with research inquiries.
5	Baze University, Abuja	University implemented a robot to assist users with locating books and other materials in the library. The robot can guide users to the location of specific books, and it can also provide information on the library's services and resources.

(**Source:** Authors' generated, 2024)

Table 1 provides a brief discussion of activities of academic libraries that have commenced the adoption of Artificial Intelligence and Robotics for their various library operations. From Table 1, it is highly discouraging that only five (5) universities out of 170 functional universities that were approved at National Universities Commission (NUC, 2023) adopted AI. What might be responsible for low adoption of AI in academic libraires in Nigeria could be traced to emerging isuues confronting academic libraries.

Emerging Issues in Artificial Intelligence's adoption by academic libraries in Nigeria

Artificial Intelligence (AI) refers to a tool or system capable of executing a particular intelligent task, also known as artificial narrow intelligence (ANI), and its presence is steadily expanding across Africa. However, despite the significant benefits AI systems offer to the continent, several barriers hinder their adoption and utilisation. The challenges confronting the adoption and use of AI include:

1. Inadequate Expertise: A significant barrier to the adoption of AI in libraries is the lack of competency among stakeholders. Mastering AI skills is challenging, leading to a shortage of expertise to meet the demand. This scarcity of AI proficiency is particularly pronounced in developing markets like Africa (Ajadi, 2020).
2. Digital Literacy Deficiency: Another major obstacle to AI implementation in Africa is the lack of digital literacy skills. Sub-Saharan Africa lags behind other regions in terms of digital skills adoption, hindering the development, implementation, and utilization of AI applications (Madden & Kanos, 2021). Stakeholders in the education sector recognize the necessity for enhancing skills during the

4th industrial revolution to effectively leverage AI technologies (Ade-Ibijola & Okonkwo, 2023; Oke & Fernandes, 2020).

3. Poor Internet Connectivity: Effective utilization of AI in libraries relies heavily on robust internet connectivity. Inadequate infrastructure and investment in internet infrastructure across Africa, such as fibre-optic cables and cell towers, contribute to poor internet penetration rates (ITU, 2021).
4. Limited Data Access: Insufficient data accessible to African researchers poses a significant challenge to the adoption of AI in Africa. Machine learning algorithms require large datasets for training, and the lack of representative data hampers algorithm effectiveness (ITU, 2021).
5. Funding Constraints: The adoption and use of AI in libraries require substantial financial investment. Inadequate funds may prevent libraries from acquiring the latest ICT gadgets necessary for effective AI utilisation (Osagie & Oladokun, 2024; Udo-Okon & Akpan, 2024)
6. Fear of Job Displacement: Despite the numerous benefits of AI, stakeholders often fear job displacement due to AI applications. Concerns about automation disrupting traditional work processes hinder widespread acceptance of AI (Mzmkandaba, 2019; Ade-Ibijola & Okonkwo, 2023). This might be due to limited knowledge of AI by stakeholders that lead to resistance to change as result of negative perception towards adoption of AI technologies.
7. High Cost of AI Technologies: The high cost of ICT equipment, coupled with a lack of digital infrastructure, discourages AI adoption and use in Africa.
8. Political Interference: Dirty politics may result in policies that discourage experts from showcasing their skills, leading to brain drain within the AI sector.
9. Ethical Issues: Ethical considerations pose a challenge to AI adoption in Africa, with initiatives struggling to address ethical and legal concerns arising from AI technology. As reitersted by Okoje and Awoyemi (2024) that AI intergration in the academic library context may be subject to potential ethical breaches.
10. Limited involvement of stakeholders in AI Technologies: The low participation in AI technologies among stakeholders is one of the challenges facing adoption and use of AI (Okoje & Awoyemi, 2024)
11. Lack of Relevant Government Policies: Many African countries lack comprehensive AI legislation and regulatory frameworks, primarily due to policymakers' limited expertise in AI and related emerging technologies. Also, the absence of AI legislation proposed by African governments highlights the need for policymakers with technology expertise and greater involvement of highly-experienced professionals in developing AI legislation (Daoud & ZereGoitom, 2022).

Conclusion

Artificial Intelligence (AI) has become a broad category encompassing various digital tools that are reshaping the landscape of libraries. While the adoption and utilisation of AI are rapidly increasing worldwide, academic libraries have been slow to adopt AI technologies, with the current level of adoption being minimal. Moreover, there is a dearth of research on AI in librarianship, particularly in Africa and Nigeria, creating a significant gap in the literature that requires attention.

AI tools such as chatbots, document classification, personalized services, text and data mining (TDM), intelligent education, and user discovery offer promising avenues for research, access provision, and educational development in libraries. These tools have the potential to enhance education by providing deep intelligence offerings and fostering educational growth. Additionally, recent advancements in AI have enabled libraries to provide AI education to stakeholders at various levels.

Furthermore, AI applications in libraries can facilitate the creation of community spaces where patrons can interact with information in a safe and private environment. AI can also assist library users with learning difficulties and support librarians and educators through personalized learning experiences. As AI becomes increasingly integrated into library operations, there is an opportunity for the profession to embrace AI and embark on a journey of coexistence with this transformative technology.

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Perceived Roles of AI-Powered Educational Technologies on Undergraduates' Academic Excellence in Selected Library Schools in South-west, Nigeria.

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Abstract
The integration of AI into education aims to optimize learning outcomes, enhance efficiency, and empower educators and students alike. This study examined the perceived roles of AI-powered educational technologies on undergraduates' academic excellence in selected library schools in South-West, Nigeria. A descriptive survey research design was adopted for this study. A stratified random sampling technique was employed to select 324 undergraduate students in three (3) selected library schools in South-West, Nigeria. A self-designed and close-ended questionnaire was used as the instrument for gathering data from the respondents. Pearson Product Moment Correlation (PPMC) was used to analyse the data gathered. Findings revealed that perceived roles of AI-powered educational technologies significantly enhance academic excellence ($r = .687^{**}$), academic knowledge ($r = .816^{**}$), quality education ($r = .530^{**}$) and knowledge accessibility ($r = .650^{**}$) among undergraduates in selected library schools in South-West, Nigeria ($p < .05$). Based on the findings, it was recommended that universities should invest in robust AI infrastructure and platforms that support personalized learning experiences and adaptive educational technologies. Educational policymakers should establish clear guidelines and ethical frameworks for the responsible implementation of AI in education; they should collaborate with educators.

Keywords: Artificial Intelligence (AI)-Powered Educational Technologies, Academic Excellence, Undergraduates, Library Schools, Nigeria.

Introduction

Within any educational environment, academic excellence assumes pivotal significance, serving as an indicator of a student's proficiency in grasping the educational content. While academic success does foster competition among students and, at times, may divert attention from the intrinsic academic substance, it stands as an essential prerequisite for attaining success in subsequent educational stages (Jesusa, Christine & Cherisse, 2023). Academic refers to anything related to education, particularly in the context of an academic environment such as a school, college or other educational institution. The term encompasses the activities, knowledge and norms associated with learning and teaching (Rubas, 2023). In an academic context, the main focus is on the development of knowledge, skills and conceptual understanding. It involves activities such as teaching, research, writing scientific papers, and evaluating academic excellence. Academia covers a wide range of disciplines, and this approach aims to facilitate intellectual growth and individual development through learning and contributing to the development of knowledge more broadly (Sunaiyah, Siswanto, Dermawan & Hashanah, 2022). Students refer to individuals enrolled in an institution of higher education, such as a university or college. They are active participants in an educational programme that aims to acquire knowledge, skills and understanding in a particular field. Students engage in various academic activities, including attending lectures, doing assignments, and participating in class discussions (Kogteva & Kirilina, 2019).

Moreover, technology facilitates interactive and collaborative learning experiences. Educational software, multimedia presentations, and online platforms enable students to interact with course content dynamically, such as through simulations, virtual labs, and interactive quizzes (Shadiev, Yi & Altinay, 2024). Moreover, technology offers personalized learning experiences tailored to individual student needs and learning styles. Adaptive learning platforms leverage data analytics and AI algorithms to track student progress and adapt instructional content accordingly, providing targeted interventions and remediation where needed. This personalized approach addresses gaps in understanding and ensures that each student receives the necessary support to succeed (Vermeulen & Volman, 2024). Artificial Intelligence (AI) plays a pivotal role in revolutionizing education by automating tasks, analyzing data, and providing intelligent insights to enhance teaching and learning processes (Dahal, 2024).

AI-powered educational technologies can perform tasks such as grading assessments, offering personalized recommendations, and even tutoring students in specific subjects. Machine learning algorithms enable these technologies to evolve and improve over time, refining their ability to support student learning effectively. The integration of AI into education aims to optimize learning outcomes, enhance efficiency, and empower educators and students alike (Rizvi, 2023). Artificial Intelligence (AI) can use extensive educational data to identify patterns, trends, and areas for improvement, enabling educators to make data-driven decisions and tailor instructional strategies to meet the diverse needs of students (Tobler, 2024). For students, AI-powered technologies offer personalized learning experiences, adaptive feedback, and opportunities for self-directed learning, ultimately enhancing

academic excellence. The field of artificial intelligence has led to the emergence of human-like intelligence in computers, machines, and other artefacts. Artificial intelligence (AI) in education significantly influences how the curriculum is designed and how students are engaged (Montgomery, 2024).

Artificial Intelligence (AI) powered educational technologies are revolutionizing the landscape of higher education by significantly enhancing academic knowledge, quality education, and knowledge accessibility for university students. These technologies, ranging from intelligent tutoring systems to personalized learning platforms, provide tailored educational experiences that adapt to the individual learning pace and style of each student. This personalized approach ensures that students receive the support they need exactly when they need it, thereby improving their understanding of complex subjects and enhancing overall academic performance (Tobler, 2024). Moreover, AI-powered technologies contribute to quality education by enabling more interactive and engaging learning experiences. Virtual reality (VR) and augmented reality (AR) technologies, powered by AI, allow students to immerse themselves in realistic simulations and hands-on activities that would be impossible in traditional classroom settings. For instance, medical students can practice surgeries in a virtual environment, while engineering students can experiment with building structures without the risk of real-world consequences. These immersive learning experiences not only make education more engaging but also help students retain information more effectively (Vermeulen & Volman, 2024).

Additionally, AI technologies facilitate continuous assessment and feedback, allowing educators to monitor student progress in real-time and adjust their teaching strategies accordingly. This dynamic interaction between students and AI systems fosters a more responsive and supportive educational environment, ultimately leading to higher educational standards and better learning outcomes (Su & Zhong, 2022). Accessibility of knowledge is another area where AI educational technologies have a profound impact. These technologies democratize education by making high-quality learning resources available to a broader audience, regardless of geographical or socioeconomic barriers. Online learning platforms powered by AI can offer courses from top universities and educators to students across the globe, providing them with opportunities that were previously inaccessible. AI-driven translation technologies break down language barriers, allowing students to access educational content in their native languages (Sunaiyah, Siswanto, Dermawan & Hasanah, 2022). Additionally, the ability of AI to analyze and summarize large volumes of information helps students navigate and understand vast amounts of data efficiently, making research and self-study more manageable. AI technologies can assist students with disabilities by providing customized support, such as speech-to-text applications for students with hearing impairments or adaptive learning technologies for students with cognitive challenges (Shadiev, Yi & Altinav, 2024). In light of the above background, this study therefore intends to investigate the perceived roles of AI-powered educational technologies on undergraduates' academic excellence in selected library schools in South-West, Nigeria.

Statement of the Problem

It is observed that the use of AI-powered educational technologies can potentially make students overly reliant on automated systems, leading to decreased motivation and engagement in active learning, and subsequently making them lazy. Additionally, these technologies pose significant security and privacy risks, as they often involve collecting and processing sensitive personal data, which can be vulnerable to breaches, and can lead to a loss of human decision-making, undermining the critical thinking and problem-solving skills that are essential in education. Moreover, in previous studies; Tutika, Kondavalasa and Patnaik (2024) examined the impact of AI on students' academic achievement in India; Crisha *et al*. (2023) examined Artificial Intelligence (AI) as a technology in increasing academic performance of BPEd students at Cebu Normal University, Tarik and Nian (2016) investigated the relationship between students' outcome of a particular course of their social backgrounds and use of Artificial Intelligence (AI). The present study aims to fill several gaps identified in previous studies (Tutika *et al*., 2024; Crisha *et al*., 2023; Tarik and Nian, 2016). However, these studies lack a specific focus on the Nigerian educational context, particularly in a university dedicated to education training like Tai Solarin University. This research intends to provide localized insights into how AI technologies can specifically influence undergraduate academic excellence in Nigeria, addressing contextual differences and potential unique challenges faced by Nigerian students. It is therefore imperative to investigate the perceived roles of AI-powered educational technologies on undergraduates' academic excellence in selected library schools in South-West, Nigeria.

Objectives of the Study

The general objective of the study is to investigate the perceived roles of AI-powered educational technologies on undergraduates' academic excellence in selected library schools in South-West, Nigeria. However, this study will also focus on the following specific objectives to:

1. examine the perceived roles of AI-powered educational technologies on undergraduates' academic excellence in selected library schools in South-West, Nigeria;
2. examine the perceived roles of AI-powered educational technologies on undergraduates' academic knowledge in selected library schools in South-West, Nigeria;
3. examine the perceived roles of AI-powered educational technologies on quality education among undergraduates in selected library schools in South-West, Nigeria;
4. examine the perceived roles of AI-powered educational technologies on knowledge accessibility among undergraduates in selected library schools in South-West, Nigeria.

Research Questions

The following research questions were carefully formulated to guide the study:

i. What are the perceived roles of AI-powered educational technologies on undergraduates' academic excellence in selected library schools in South-West, Nigeria?

ii. What are the perceived roles of AI-powered educational technologies on undergraduates' academic knowledge in selected library schools in South-West, Nigeria?

iii. What are the perceived roles of AI-powered educational technologies on quality education among undergraduates in selected library schools in South-West, Nigeria?

iv. What are the perceived roles of AI-powered educational technologies on knowledge accessibility among undergraduates in selected library schools in South-West, Nigeria?

Literature Review

Rahul (2020) examined the impact of Artificial Intelligence (AI) in the field of education. The study found that there were quite differences between the opinions of both students and teachers regarding the questions. This clearly showed the difference in the knowledge about the subject and its consequences which could be there. Firstly, more students considered the role of AI as an educator as software, whereas, teachers preferred it as a program. Then, more teachers were optimistic about AI increasing the cognitive abilities of the students, whereas more of the students preferred to be neutral. Moreover, the students seemed more assured that AI will help enhance the school experience of the students with disabilities than the teachers. Furthermore, both students and teachers almost equally agreed and disagreed regarding matching the level of motivation and inspiration as an educator does for AI. Then, students seemed to be equally distributed regarding the issue of misusing the personal information of students between yes, no, and maybe. Whereas, teachers seemed more inclined towards the option of maybe more than yes and no. Additionally, about the discipline issues, students seemed to be more confident about the capabilities of AI to tackle it than the teachers. Finally, there were way more students convinced that AI could replace teachers completely in the future.

Immaculada, Jose, Jose and Samuel (2023) analyse, quantitatively and qualitatively, the impact of AI components and computational sciences on student performance. For this purpose, a systematic review and meta-analysis have been carried out in WOS and Scopus databases. After applying the inclusion and exclusion criteria, the sample was set at 25 articles. The results support the positive impact that AI and computational sciences have on student performance, finding a rise in their attitude towards learning and their motivation, especially in the STEM (Science, Technology, Engineering, and Mathematics) areas. Despite the multiple benefits provided, the implementation of these technologies in instructional

processes involves a great educational and ethical challenge for teachers about their design and implementation, which requires further analysis from educational research. These findings are consistent at all educational stages.

Sayed, Heesup, Muhammad, Mohd, Muhammad, Marcelo and Antonio (2023) examined the impact of artificial intelligence (AI) on loss in decision-making, laziness, and privacy concerns among university students in Pakistan and China. Like other sectors, education also adopts AI technologies to address modern-day challenges. AI investment will grow to USD 253.82 million from 2021 to 2025. However, worryingly, researchers and institutions across the globe are praising the positive role of AI but ignoring its concerns. This study is based on qualitative methodology using PLS-Smart for the data analysis. Primary data was collected from 285 students from different universities in Pakistan and China. The purposive Sampling technique was used to draw the sample from the population. The data analysis findings show that AI significantly impacts the loss of human decision-making and makes humans lazy. It also impacts security and privacy. The findings show that 68.9% of laziness in humans, 68.6% in personal privacy and security issues, and 27.7% in the loss of decision-making are due to the impact of artificial intelligence in Pakistani and Chinese society. From this, it was observed that human laziness is the most affected area due to AI. However, this study argues that significant preventive measures are necessary before implementing AI technology in education. Accepting AI without addressing the major human concerns would be like summoning the devils. Concentrating on justified designing deploying and using AI for education is recommended to address the issue.

Hussain, Shamim, Sankar, Kumar, Samanta and Sakhare (2022) examined the effect of Artificial Intelligence on learning quality and practices in higher education. Computers have been employed in the field of education for many years. However, recent and current research within the field of artificial intelligence (Al) is having a positive impact on education. For example, there now exist ICAI (intelligent computer-assisted instruction) systems to teach or tutor many different subjects; several such systems are discussed herein. In addition to CA1 (computer-assisted instruction) systems, we discuss the development of learning environments that are designed to facilitate student-initiated learning. A third major application is the use of expert systems to assist with educational diagnosis and assessment. During the course of our discussion of these three major application areas, we indicate where AI has already played a major role in the development of such systems and where further research is required to overcome current limitations. AI is perceived as a bane and also a boon to the education system and the human intellect. Optimistic utilization of AI in the classrooms is highly recommended by both teacher and student participants. It is also identified that the majority of teachers are more adaptable to embrace new technological changes than students. Further study on generation and geographic diversity based on teacher and student perceptions may support more effective implementation of AI in education.

Methods

Research Design

Descriptive survey research design was adopted for this study.

Population of the Study

The population of this research study comprised undergraduates in the Department of Library and Information Science in three (3) selected library schools in Nigeria, which are University of Ibadan, Lead City University and Tai Solarin University of Education.

Sample and Sampling Technique

Stratified random sampling technique was employed to capture the undergraduates in the selected universities. Due to the large population size of the undergraduates in each selected university, the researcher used 20% of the population. This is supported by the study of Agbonmiewalent (2007) who stated that "when he recommended that when the population runs into few hundreds use 30% or more, when several hundred use 25% and below, when few thousands use 20% and when several thousand use 10% or less". As a result, the sample size for the study was 324.

Table 1: Distribution of Sample

S/N	Universities	Population	Sample (20%)
1	Tai Solarin University of Education	1,375	275
2	University of Ibadan	184	37
3	Lead City University	62	12
	Sample Size	**1,621**	**324**

Source: Student from each library school

Research Instrument

A self-designed and close-ended questionnaire was used as the instrument in gathering data from the respondents. The questionnaire comprised twenty (20) items related to the perceived roles of Artificial Intelligence (AI)-powered educational technologies on improving academic excellence, quality education, academic knowledge and knowledge accessibility of students.

Procedure for Data Collection

Three hundred and twenty-four (324) copies of questionnaires were distributed in the selected universities, which cut across first year to fourth year students within the period of 2 weeks. The completed questionnaire was retrieved on the spot, after giving respondents enough time to fill the questionnaires.

Method of Data Analysis

The Statistical Package for the Social Sciences (SPSS version 21) was used to arrange and illustrate the data using Pearson Product Moment Correlation (PPMC).

Results

RQ1: What are the perceived roles of AI-powered educational technologies on undergraduates' academic excellence in selected library schools in South-West, Nigeria?

Table 2: Pearson Correlation Analysis of Research Question 1

		AI-powered educational technologies	**Academic excellence**
AI-powered educational technologies	Pearson Correlation	1	.687**
	Sig. (2-tailed)		.000
	N	324	324
Academic	Pearson Correlation	.687**	1
Excellence	Sig. (2-tailed)	.000	
	N	324	324

Table 2 presented result of Pearson correlation showing relationship between Artificial Intelligence (AI)-powered educational technologies and academic excellence. The result showed that there is a strong relationship between Artificial Intelligence (AI)-powered educational technologies and academic excellence ($r = .687^{**}$, $N=324$, $P < .05$). Hence, the perceived roles of AI-powered educational technologies significantly enhance undergraduates' academic excellence in selected library schools in South-West, Nigeria. This is shown by its value of .000 which is less than the level of significance (0.05).

RQ2: What are the perceived roles of AI-powered educational technologies on undergraduates' academic knowledge in selected library schools in South-West, Nigeria?

Table 3: Pearson Correlation Analysis of Research Question 2

		AI-powered educational technologies	**Academic knowledge**
AI-powered educational technologies	Pearson Correlation	1	.816**
	Sig. (2-tailed)		.001
	N	324	324
Academic	Pearson Correlation	.816**	1

knowledge	Sig. (2-tailed)	.001	
	N	324	324

Table 3 presented result of Pearson correlation showing relationship between Artificial Intelligence (AI)-powered educational technologies and academic knowledge. The result showed that there is a strong relationship between Artificial Intelligence (AI)-powered educational technologies and academic knowledge (r = .816**, N=324, P < .05). Hence, AI-powered educational technologies are perceived to enhance undergraduates' academic knowledge among undergraduates in selected library schools in South-West, Nigeria. This is shown by its value of .001 which is less than the level of significance (0.05).

RQ3: What are the perceived roles of AI-powered educational technologies on quality education among undergraduates in selected library schools in South-West, Nigeria?

Table 4: Pearson Correlation Analysis of Research Question 3

		AI-powered educational technologies	**Quality education**
AI-powered educational technologies	Pearson Correlation	1	.530**
	Sig. (2-tailed)		.010
	N	324	324
Quality education	Pearson Correlation	.530**	1
	Sig. (2-tailed)	.010	
	N	324	324

Table 4 presented result of Pearson correlation showing relationship between Artificial Intelligence (AI)-powered educational technologies and quality education. The result showed that there is a moderate relationship between Artificial Intelligence (AI)-powered educational technologies and quality education (r = .530**, N=324, P < .05). Hence, Artificial Intelligence (AI)-powered educational technologies are perceived to enhance quality education among undergraduates in selected library schools in South-West, Nigeria. This is shown by its value of .010 which is less than the level of significance (0.05).

RQ4: What are the perceived roles of AI-powered educational technologies on knowledge accessibility among undergraduates in selected library schools in South-West, Nigeria?

Table 5: Pearson Correlation Analysis of Research Question 4

		AI-powered educational technologies	Knowledge accessibility
AI-powered educational technologies	Pearson Correlation	1	.650**
	Sig. (2-tailed)		.000
	N	324	324
Knowledge accessibility	Pearson Correlation	.650**	1
	Sig. (2-tailed)	.000	
	N	324	324

Table 5 presented result of Pearson correlation showing relationship between Artificial Intelligence (AI)-powered educational technologies and knowledge accessibility. The result showed that there is a strong relationship between Artificial Intelligence (AI)-powered educational technologies and knowledge accessibility ($r = .650^{**}$, $N=324$, $P < .05$). Hence, Artificial Intelligence (AI)-powered educational technologies are perceived to improve knowledge accessibility among undergraduates in selected library schools in South-West, Nigeria. This is shown by its value of .000 which is less than the level of significance (0.05).

Discussion

The survey found that the perceived roles of AI-powered educational technologies significantly enhance undergraduates' academic excellence in selected library schools in South-West, Nigeria. AI-powered technologies in education have been shown to enhance academic excellence by providing personalized learning experiences, adaptive feedback, and opportunities for self-directed learning. This finding is consistent with the study of Tobler (2024), which highlighted how AI technologies contribute to tailored educational experiences that adapt to individual learning styles and paces, thereby improving overall academic performance. This finding is also supported by Rizvi (2023), who emphasizes AI's role in optimizing learning outcomes and empowering both educators and students through personalized educational strategies.

The survey found that AI-powered educational technologies are perceived to enhance undergraduates' academic knowledge among undergraduates in selected library schools in South-West, Nigeria. AI technologies leverage machine learning algorithms to analyze educational data, identify patterns, and personalize learning content, which enhances students' academic knowledge. This finding aligns with the research of Immaculada *et al*. (2023), who conducted a systematic review and meta-analysis demonstrating that AI and computational sciences positively impact student learning outcomes, particularly in STEM areas, by improving attitudes towards learning and motivation.

The survey found that Artificial Intelligence (AI)-powered educational technologies are perceived to enhance quality education among undergraduates in selected library schools in South-West, Nigeria. AI-powered educational technologies contribute to quality education by offering interactive and engaging learning experiences through technologies like virtual reality (VR) and augmented reality (AR). These technologies enable students to immerse themselves in realistic simulations and hands-on activities, thereby enriching the learning process. This finding is consistent with Vermeulen & Volman (2024), who discussed how AI-driven technologies enhance educational quality by facilitating more engaging and effective learning environments. This finding also correlates with Montgomery (2024), who discusses how AI enhances educational quality through interactive and engaging learning environments that cater to diverse learning styles and needs.

The survey found that Artificial Intelligence (AI)-powered educational technologies are perceived to improve knowledge accessibility among undergraduates in selected library schools in South-West, Nigeria. AI technologies democratize education by breaking down geographical and socioeconomic barriers through online platforms and AI-driven translation technologies. These technologies provide access to high-quality educational resources and content in diverse languages, thereby enhancing knowledge accessibility. This finding resonates with the research of Sunaiyah *et al*. (2022), who highlighted how AI enhances accessibility by making educational content available to a broader audience and supporting diverse learning needs.

Conclusion

In conclusion, the integration of Artificial Intelligence (AI) into educational technologies has presented a transformative paradigm in the field of Library and Information Science (LIS). Throughout the exploration of AI-powered educational technologies, it became evident that these technologies play a crucial role in enhancing academic excellence, improving knowledge acquisition, enriching educational quality, and enhancing accessibility for LIS students. AI educational technologies have been shown to enhance academic excellence by offering personalized learning experiences tailored to individual student needs and learning styles. Through adaptive feedback mechanisms and personalized content delivery, AI technologies assist in refining students' understanding and mastery of complex subjects. AI technologies contribute significantly to improving academic knowledge among LIS students by leveraging machine learning algorithms to analyze educational data and predict learning patterns. This capability not only enhances students' retention of information but also fosters a deeper comprehension of theoretical concepts and practical applications within the field. In addition, AI educational technologies enhance the overall quality of education by creating interactive and immersive learning experiences. Technologies such as virtual reality (VR) and augmented reality (AR), powered by AI, provide students with realistic simulations and hands-on learning opportunities that transcend traditional classroom boundaries. AI educational technologies promote knowledge accessibility by breaking down barriers of geography and socioeconomics. Online platforms and AI-

driven translation technologies enable LIS students to access high-quality educational resources and content in their native languages, thereby democratizing education on a global scale.

Recommendations

Based on the findings, it was recommended that lecturers should embrace professional development opportunities focused on AI literacy and integration into curriculum planning; continuous training will empower educators to leverage AI technologies effectively to enhance teaching methodologies and student engagement. Universities should invest in robust AI infrastructure and platforms that support personalized learning experiences and adaptive educational technologies; universities should prioritize resources for AI research and development to stay at the forefront of educational innovation. Educational policymakers should establish clear guidelines and ethical frameworks for the responsible implementation of AI in education; they should collaborate with educators, researchers, and industry experts to ensure AI technologies prioritize student privacy, equity, and inclusivity. Researchers should conduct longitudinal studies to evaluate the long-term impact of AI on student learning outcomes and educational equity; research efforts should focus on assessing the effectiveness of AI technologies across diverse educational settings and student populations. Technology developers should enhance AI algorithms to better accommodate the diverse learning needs and preferences of students in different disciplines, including Library and Information Science; developers should prioritize user-centred design principles to create intuitive and accessible AI educational technologies. Students should engage actively with AI technologies as learning technologies and seek opportunities to provide feedback on their usability and effectiveness; they should advocate for inclusive AI solutions that address accessibility barriers and support diverse learning styles.

Implications

The findings of the study reveal significant implications for various stakeholders within the educational ecosystem, particularly in the context of Library and Information Science (LIS) education in South-West Nigeria. The integration of AI-powered educational technologies has the potential to revolutionize the way education is delivered and received, providing numerous benefits that can enhance the overall learning experience and outcomes for students. Firstly, for students, AI-powered educational technologies offer personalized learning experiences that cater to individual needs and learning styles. This personalization can lead to improved academic performance, as students receive tailored content and feedback that address their specific strengths and weaknesses. The ability of AI to analyze learning patterns and adapt instructional methods accordingly can help students better understand and retain complex concepts, ultimately fostering deeper knowledge and mastery of the subject matter. For educators, the adoption of AI technologies can significantly enhance teaching methodologies. AI technologies can assist in identifying learning gaps and providing real-time feedback, enabling educators to develop more effective and efficient teaching strategies. The use of AI

can also reduce the administrative burden on teachers by automating tasks such as grading and attendance tracking, allowing them to focus more on direct student engagement and support.

Furthermore, educational institutions stand to benefit from investing in AI infrastructure, as it can lead to more flexible and accessible education. By leveraging AI-driven platforms, universities can offer high-quality educational resources that are accessible to students regardless of their geographic location or socioeconomic status. This democratization of education can help institutions attract a diverse student body and promote an inclusive learning environment. Moreover, policymakers play a crucial role in ensuring the responsible implementation of AI in education. Establishing clear ethical guidelines and standards for the use of AI technologies is essential to protect student privacy and promote equity. Policymakers should collaborate with educators, researchers, and industry experts to develop policies that maximize the benefits of AI while addressing potential risks and challenges. The study also highlights the importance of ongoing research to evaluate the long-term impact of AI on educational outcomes. Researchers should conduct longitudinal studies to assess the effectiveness of AI technologies across different educational settings and student populations. Such research can provide valuable insights into how AI can be used to support diverse learning needs and improve educational equity.

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Social Influence as Determinant of Awareness and Use of Electronic Databases by Academic Staff in University

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Abstract
The purpose of this study is to analyse the affect of the social influence construct on awareness and use of electronic databases by academic staff in Umaru Musa Yar'adua University, Katsina. Quantitative method and survey research design were adopted for this study. The study was guided by the Unified Theory of Technology Acceptance and Usage (UTAUT). The study targeted 110 respondents selected through simple random sampling from a population of 523 academic staff at seven Faculties and the University Library. The data was collected using closed-ended questionnaire with Likert scaling technique. The data analysis was conducted using the Statistical Package for Social Sciences (SPSS) version 23. The findings revealed that awareness and use of electronic databases is significantly associated with social influence construct. Additionally, influence of colleagues, librarians, behavioural intention and surfing through the internet were found to have significant impact on the awareness and use of the electronic databases. Furthermore, social media, e-mail and mimetic were found to be less influencing. These findings have significant implications for practitioners and library management. This study recommended that the university library management and the e-librarians should embrace many strategies to increase awareness and use of electronic databases. These strategies include leveraging on social media platforms and e-mail to reach out to the members of the university community.

Keywords: Awareness, Electronic databases, Academic staff, Unified Theory of Acceptance and Use of Technology (UTAUT), Social Influence

Introduction

Electronic databases (refer after as e-databases) are the most used technological innovations that provide access to current, relevant, and up-to-date information to a community of users (Adam, 2018). E-databases are playing significant roles towards teaching, learning and research. However, research has noted that e-databases often remain under used by academic staff. Studies (Faletar, Dragija & Cupar, 2017; Togia & Tsigilis, 2009) have reported that the use of e-databases is fraught with many issues. These issues include lack of awareness, inadequate searching skills, lack of access to e-databases outside the university campus, lack of assistance from librarians, lack of time to spend on searching among others. Aina

(2014) concluded that lack of awareness constitute the key factor against the effective use of electronic databases. In addition, Ankrah and Atuase (2018) noted that users can only access and utilize e-databases when they are aware of their availability. Hence, it would be highly difficult to access and use resources that you are not aware of even if they are available in the library. To that end, awareness of subscribed e-databases by academic staff cannot be over-emphasized.

Accordingly, Suleiman and Joshua (2019) stated that there are inverse and weak relationships between awareness and utilization of e-databases among academic staff of tertiary institutions in Nigeria. Therefore, this study, applied the Unified Theory of Acceptance and Use of Technology (UTAUT) model to analyse the general perceptions of academic staff on the affect of social influence on awareness and use of e-databases at Umaru Musa Yar'adua University, Katsina.

Technology acceptance models/theories are used in studies predicting and explaining individual's behaviours towards the acceptance and usage of new technologies. The UTAUT explains user intentions for using an information system (IS) and subsequent usage behaviour. The theory holds that four key constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) are direct determinants of usage intention and behavior (Venkatesh, Morris, Davis, & Davis, 2003). In this study, the social influence construct is applied to address the objective of this study.

According to Venkatesh et al. (2003), Zhang, Zou, Miao, Zhang, Hwang, and Zhu (2019), social influence is the degree to which an individual perceives that using a system might be due to the influence of individuals around him/her. This point out that social influence is significant for the awareness and use of the systems. Baruchson-Arbib (2007) states that a potential user of new technology can only become aware of that technology through the influence of individuals around him/her. Based on these facts, this study aims to:

1. Determine how social influence construct affect awareness and use of electronic databases by academic staff in Umaru Musa Yar'adua University, Katsina

Literature review/Theoretical foundation

The Unified Theory of Acceptance and Use of Technology (UTAUT) were developed by Viswanath Venkatesh, Michael Morris, Gordon Davis, and Fred Davis in 2003. These scholars proposed and validated the model based on a social cognitive theory with a combination of eight prominent IT acceptance research models. These IT acceptance models are the Theory of Reason Action (TRA) (Fishbein and Ajzen 1975); Social Cognitive Theory (SCT) (Bandura 1986); Technology Acceptance Model (TAM) (Davis 1989); Theory of Planned Behaviour (TPB) (Ajzen 1991); Model of Personal Computer Utilisation (MPCU) (Thompson et al. 1991); Motivational Model (MM) (Davis et al. 1992); Combined TAM and TPB (C-TAM-TPB) (Taylor and Todd 1995); and Diffusion of Innovation Theory (DOI) (Rogers 1995). Venkatesh et al. (2003) examined the predictive validity of the eight models in determining the behavioural intention and usage to allow a fair comparison of the models. As noted by Alatawi, Dwivedi, Williams and Rana (2012), the model was proposed and validated to provide a unified theoretical basis

to facilitate research on information system (IS) and information technology (IT) adoption and diffusion.

The UTAUT integrates issues from the eight different theories/models into four main core determinants: Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC), and four control variables, which are: Gender, Age, Experience and Voluntariness to Use. Venkatesh et al. (2003) pointed out that the purpose of the UTAUT model is to offer management tools, to weigh the introduction of new technology, and predict and explain the user's behavior in accepting IT. The theory holds the four key constructs (PE, EE, SI, and FC) as direct determinants of usage intention and behaviour as shown in Figure 1. Gender, age, experience, and voluntariness of use are posited to moderate the impact of the four key constructs on usage intention and behavior. Although the UTAUT model was used initially in developed countries, it could also be adopted in the African context as well. Notable African researchers, for example, Alabi (2016), Machimbidza (2015), Attuquayefio and Addo (2014), Dulle and Minishi-Majanja (2011), and Sreenivasarao (2013) have all used the model in their research. Figure 1 below depicts the UTAUT model's constructs or variables and its moderators.

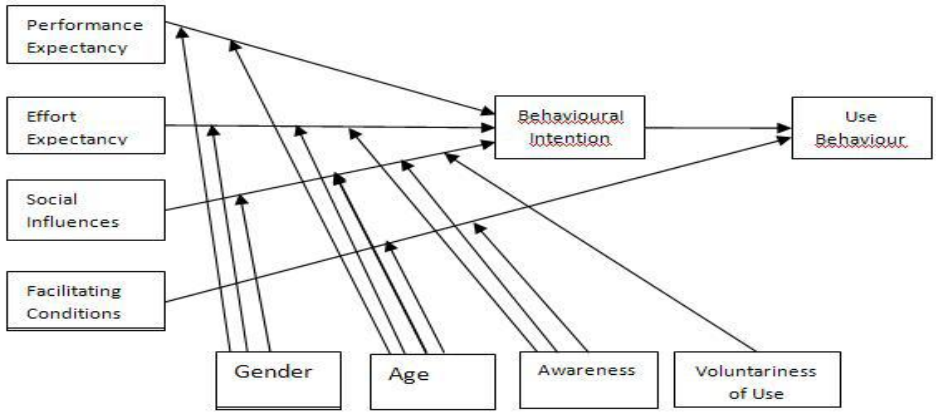

Figure 1: The Unified Theory of Acceptance and Use of Technology model

Social Influence (SI) Context

Social influence is the degree to which the user perceives that using a system might be due to the influence of individuals around him/her (Venkatesh, 2003). This variable has been arranged from the three sub-dimensions from the documents in the past, which are 'subjective norm' (TRA, TAM, TPB/DPTB, C-TAM/TPB), 'social factor' (MPCU), and 'public image' (DOI). This construct was found to be helpful in the current study in determining the general perceptions of the academic staff on the influence of librarians and colleagues around them towards the awareness and use of e-databases. According to Anna and Leelanayagi (2014), awareness is an important factor that affects and builds the right perceptions towards adopting an IT system. Anna and Leelanayagi further stated that the SI construct is specifically meant to communicate the technology via awareness as a moderator over time among the members of a social system. Accordingly, Dulle, and Minishi-Majanja (2011) identified age, awareness, experience, gender, and

position as UTAUT moderator variables. These scholars advanced that system awareness affects PE, and IU of open access resources. Similarly, researchers (Al Awadhi & Morris, 2008; Rogers, 1995; Taylor & Todd, 1995; Venkatesh et al., 2003; Rogers, 2003) have reported that social influence is important in persuading acceptance and use of new technology.

Awareness of the e-databases among library users is essential to their adoption and use in any library. This is because, it would be difficult for a library user to access and use resources that he or she is unaware of, even if the person possesses all the necessary skills (Acheampong, Boakye & Agyekum, 2019). Adam (2017) defined awareness as knowledge, perception of a situation, consciousness, recognition, and familiarity with or knowledge of the subject matter. Basiru and Okwilagwe (2018) emphasised that awareness is the ability of people to realize or know that something exists. This implies that awareness of e-databases by academic staff in institutions of higher learning is important because the ultimate use of the e-databases is for academics to be aware of and use them effectively to contribute to academic achievement.

Therefore, from this perspective, awareness of e-databases is all about informing the users about the subscribed databases available. Awareness could be through various programmes such as promotion and marketing, user education, library bulleting, notice boards, fliers, library websites, training, and orientation. For easy access and effective use, it becomes necessary for users to be aware of the e-databases available to them. Baro, Endouware and Ubogu (2011) and Togia and Tsigilis (2010) have asserted that lack of or low awareness of the existence of information resources constitutes a major impedance to their use. Accordingly, awareness of e-databases among academic staff is a topical issue that has drawn the attention of many scholars not only in developing countries but also in developed countries.

Typical studies in the developed world include for example, Tracy and Searing's (2014) study on the use of electronic databases at the University of Illinois, USA. The study found that slightly over 80% of respondents were aware and used article databases every week or more often. A similar study was conducted by Vakkari (2008) at Carnegie Mellon University, USA, which found that the majority (78%) of users were aware and used university library databases. The situation in the UK indicates that considerable efforts were put into place to raise awareness of Open Access in the research community. Although there have been some successes over the last few years, the general level of knowledge and understanding is still low.

From the developing countries context, Tukey, Atakan, Atilgan, and Arslantekin (2008) reported that academics in all departments in the Ankara University were informed and aware about the electronic databases and majority of them were found to be using them. However, in Pakistan, Ansari (2010) revealed that most of the faculty members at the University of Karachi did not know much about the e-journals and databases available in the university library. Ansari observed that lack of awareness was one of the reasons for the non-use of e-journals. In Sri Lanka, Punchihewa (2014) reported that academic staff at the

University of Moratuwa lack awareness of electronic databases provided by the library.

In Africa, some scholars have indicated that the awareness of e-databases among academic staff is very low. For example, in Ghana, Dukper, Bawa, and Arthur (2018) showed that despite the significance of e-databases; it appears that users of the Tamale Technical University library seemed unaware of the existence of the resources. Similarly, Kwadzo (2015) reported that the level of awareness of e-databases among the academic staff at the University of Ghana, Legon was lower than usage. This was because most of the academic staffs were not aware of the databases subscribed to. Likewise, Dadzie (2005) reported that academic staffs at Ashesi University College, Ghana, were not aware of the databases subscribed to by the library. The study further revealed that patronage of the databases is very low. They attributed the low usage to the lack of awareness among the academic staff.

The situation in Zimbabwe is not different from that in Ghana. For example, Mawere, & Sai (2018) indicated that despite the efforts made by the Great Zimbabwe University to avail e-databases, there was poor use due to a lack of awareness and ignorance of the facilities among the academics. In Tanzania, Angello (2010) found that the rate of awareness of e-databases among livestock researchers in Tanzania was very low. Shija (2009) expressed a similar sentiment, stating that most of the library users in Tanzania are not aware of electronic resources. Shija further stated that PERii electronic databases are not well known among library users of institutions of higher learning. This was because library staff lacked library and marketing skills appropriate for their existing resources, including electronic databases.

In the context of Nigeria, a study conducted by Aina (2014) on awareness, accessibility, and use of electronic databases among academic staff of Babcock University Business School, discovered that the majority of the respondents were aware of electronic databases. On the contrary, Ogaraku (2018) reported that the level of awareness of the e-databases subscribed to by the Federal University of Technology, Owerri (FUTO) is very low. Therefore, given the mixed findings as highlighted above, this paper applies the Unified Theory of Acceptance and Use of Technology (UTAUT) model to determine the sources of information for the awareness and use of electronic databases by academic staff in Umaru Musa Yar'adua University, Katsina.

Methods

This study was conducted at Umaru Musa Yar'adua University, Katsina (UMYU) a conventional institution offering both undergraduate and postgraduate programs in various fields (Social Sciences, Humanities, Natural, and Applied Sciences and Law). The quantitative method and survey research design were adopted for this study primarily because they were suitable and efficient ways of studying a large population and allow a sample population to be used to represent the entire population. The target population consisted of 523 academic staff from the seven (7) Faculties and university libraries in Umaru Musa Yar'adua University.

Sample

They study's samples were identified and recruited using a proportionate stratified random sampling technique and based on the numbers of academic staff from each faculty of the study area to ensure equal representation opportunities. Israel's (2003) Table for determining sample size and its formula were employed to determine the proportionate sample size for academic staff across the faculties. The study adopted simple random sampling across the departments in distributing questionnaires. This is to ensure a justifiable recruitment of the participants from all the departments. Therefore, no department or discipline was overrepresented or underrepresented.

Instrumentation

The main research instrument used for collecting data for the study was a questionnaire. The Unified Theory of Acceptance and Use of Technology (UTAUT) construct (Social Influence) was used to construct the questionnaire items. The data was collected using the Likert scaling technique where the responses were grouped into categories from 1 to 5 (Strongly disagree, disagree, undecided, agree and strongly agree). The key research questions addressed by the study were represented by each category of the questionnaire. The data collected through closed-ended questions in the questionnaires were analysed by the Statistical Package for Social Sciences (SPSS) version 23 using descriptive statistics of frequency counts and tables.

Results

Response Rates

A total of 110 copies of questionnaires were administered to the academic staff from the seven faculties in the university library and 87 copies of the questionnaires were duly filled out and returned on time. This represents a 79% response rate, which is considered adequate and appropriate for the analysis.

Descriptive Statistics

Table 1: Demographic information of the academic staff

Measures	Items	Frequency	Percentage (%)
Gender	Male	73	83.9
	Female	14	16.1
Total		**87**	**100**
Age range of respondents	Below 40	55	23.9
	40-49	17	19.5
	50-59	31	35.6
	60 above	2	2.3
	Total	**87**	**100.0**
Educational qualification of the respondents	First degree	4	4.6
	Masters	23	26.4
	PhD	60	69.0
Total		**87**	**100.0**

(Source: field data, 2022)

The general demographic information of the respondents illustrated in Table 1 above indicated that out of the 87 complete responses received, 73 (83.9%) of the respondents were male and 14 (16.1%) of the respondents were female. This implies that the study was not biased since both males and females were involved in the study. However, the number of males was higher than that of females. In terms of the age range, 31 (35.6%) of the respondents were in the age range of 50–59 years, which made up the largest number of responses, whereas those in the category of 60 years and above constituted the least 2 (2.3%). This is because the university under study is young and hence, most of the staff is middle-aged, with an age range of 50–59 years.

With regards to the educational qualifications, 60 (69.0%) of the respondents have a PhD as their highest educational qualification; those with a Masters degree were 23 (26.4%), and only a very few, 4 (4.6%) have a first degree as their highest educational qualification. The result reflects that most of the academic staffs are still in the middle ranks of the academic ladder. However, the result reflects a very low number of graduate assistants in the university under study. This implies the need for the university management to recruit more young lectures to ensure a balance staffs mix in the system. Furthermore, more female staffs are needed to ensure gender balance and equal opportunities.

Table 2: Social Influence as determinant of awareness and use of e-databases by academic staff

	Questions	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	I become aware and use of electronic databases through the influence of librarians and colleagues around me	5 (5.7%)	20 (23.0%)	10(11.5%)	33(37.9%)	19 (21.8%)
2	Awareness of electronic databases influence my behavioural intention towards their usage	-	6 (6.9%)	14(16.1%)	54(62.1%)	13 (14.9%)
3	Librarians of my university have been helpful in making me aware and use electronic	3 (3.4%)	10 (11.5%)	21(24.1%)	42(48.3%)	11 (12.6%)

	databases					
4	I become aware and use of the electronic databases by surfing the internet	4 (4.6%)	7 (8.0%)	10(11.5%)	49(56.3%)	17 (18.7%)
5	The existence of electronic databases in other institutions motivates me to be aware and use the electronic databases	5 (5.7%)	13 (14.9%)	14(16.1%)	41(47.1%)	14 (19.5%)
6	I become aware and use of the electronic databases through social media	11 (12.6%)	33 (37.9%)	15(17.2%)	22(25.3%)	6 (6.9%)
7	I become aware of the electronic databases through E-mail from the library	16 (18.4%)	27 (31.0%)	12(13.8%)	24(27.6%)	8 (9.2%)

(Source: field data, 2022)

Results in Table 2 indicated that most of the respondents are in agreement that influence of colleagues around them, behavioural intention, influence of librarians, and surfing the Internet have been helpful in making them aware and use of electronic databases with all responses well above 50% respectively. However, e-mail from the library, social media, and existence of electronic databases in other institutions do not influence their awareness and use of the electronic databases in the study area. Here, all the responses cluster above 50% respectively.

Hypothesis Testing

Table: 3: Regression analysis of social influence factors and awareness of E-databases

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.485	.331		10.536	.000
	SI	-.107	.050	-.143	-2.151	.033
a. Dependent Variable: AU						

Hypothesis 1: *Social influence will have a significant positive influence on academic staff's awareness and intention to use electronic databases*.

The result of the regression analysis in Table 3 above showed that there is a statistical significant relationship between awareness of electronic databases and social influence. The reason has been that the calculated P value of 0.03 was found to be less than the 0.05 level of significance. The indication of this analysis is that social influence has a significant positive influence on academic staff's awareness and intention to use electronic databases. Therefore, the alternative hypothesis, which States that social influence will have a significant positive influence on academic staff's intention to use electronic databases, is hereby accepted.

Discussion

The result of the study revealed that social influence is perceived to be a strong determinant of academic staff awareness and use of electronic databases in the study area. The study found that academic staffs' sources of awareness about electronic databases were through their friends, colleagues, behavioural intention and librarians. The result concurred with previous results of Venkatesh et al., (2003); Hartwick and Barki, (1994); Schepers and Wetzel, (2007), who reported that social influence is significant in determining awareness and use of new systems. In addition, the result of the research hypothesis is supported by previous studies. However, the result of the hypothesis is contrary to the studies of Hsu et al. (2014), Li et al. (2018), and Chao (2019), who found that social influence has no significant impact on the users' intention to use technology.

Conclusion and Recommendations

This paper examines social influence as a determinant of awareness and use of electronic databases by academic staff in universities. The findings of the study showed a mixed result. The finding identified a significant percentage of the respondents agreed that social influence attributions such as colleagues around them, behavioural intention, influence of librarians, and surfing the Internet determine their awareness and use of electronic databases. On the other hand, e-mail, social media, and mimetic isomorphism were not significant determinants. With this result, it is safe to conclude that academic staffs in the university understudy are aware a colleagues around them, behavioural intention, influence of librarians, and surfing the Internet and use electronic databases as a result of social influence.

Based on these findings, the study sees a need for the university library to create more awareness about the use electronic databases. Leveraging on technologies such as social media and e-mail to reach out the academic staffs is pertinent in this case. The Library should simplify the process of informing users about subscribed electronic databases available in the library through social media handles like WhatsApp, Facebook, Twitter, and Instagram, as well as other social media platforms. Furthermore, the library should create an e-mail alert message in which academic staff and other users can be informed about any purchase or subscription to the electronic databases in the library.

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The Use of Information and Communication Technology in Libraries for Combating Global Warming in Nigeria

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Abstract
Global warming has been increasingly recognized as the greatest threat in Nigeria and other countries world over. It is a serious problem which directly affects human life and also destroys property. The causes of global warming in Nigeria could be attributed to human and natural factors such as deforestation, volcanoes, ocean currents, gases from burning fossil fuels for cars, trains, aircrafts or high concentration of greenhouse gases (GHGs) in atmospheres. The excessive emission of these GHGs causes the atmosphere to be in a polluted state which affects environment and human health directly or indirectly. One of the direct consequences of global warming to health includes cardiovascular respiratory disorder of elderly people, skin cancer, cholera and child and maternal health issues. These consequences of the global warming could be controlled, managed and mitigated with the effective use of Information and communication technology available in libraries. This is because libraries provide ICTs capable of providing relevant information that could be used to combat global warming in Nigeria. This paper highlights the concept and significance ICTs, types of ICTs available in libraries for mitigating global warming which include: internet, computers, databases, e-mail among others use to store, retrieve, transfer and disseminate information to combat global warming. The paper also examines the causes and effects of global warming as well as use of ICTs available in libraries to combat the global warming. The paper further discusses some of the identified challenges associated with the use of ICTs for combating global warming in Nigeria. The paper concludes that it is essential to note that libraries provide ICTs that will provide information about global warming, its causes, effects and possible measures to combat its menace in Nigeria.

Keywords: ICTs, Libraries, Global Warming

Introduction
Global warming has been increasingly recognized as the greatest threat of the century. It could be seen that of all the holocausts that have afflicted mankind such as plagues, earthquakes, tsunami, smallpox, HIV/AIDS among others, none has the greatest threat to wipe out lives on earth through either continuous flooding or permanent drought than global warming (Bloem and Kraemer,2010). It has been

projected that about 9 billion people will inhabit the earth by 2050, most of which live in developing countries like Nigeria (Perkins, 2010). Consequently, the world faces the most pronounced question over how our planet can sustain and feed this population due to climate change or global warming with its implications on health, food insecurity, access to clean water and the threat of an increased number of both natural and man-made disasters (Crowley, 2020). Scientists have tried to divide the causes into two broad categories, natural and human causes. The natural causes are many including earth's orbital changes, volcanic eruptions and ocean currents. The human causes include burning of fossil fuels, land-use and deforestation.

Similarly, Badru (2020) posits that global warming is a problem which directly affects human life and destroys property. It is the resultant effect of pollution of the atmosphere. When there is excessive emission of Green-HouseGases (GHG) into the atmosphere, it becomes polluted. The manifestation of these baleful effects of global warming, make Nigerian government to enforce laws to regulate the acts of individual citizens and industries which induce global warming. Therefore, these laws enforced by government must be documented and stored for use by individuals. As such, libraries as documentary centre play a vital role in documenting, processing, organizing and disseminating these laws and other relevant information to combat global warming particularly with the use of ICT facilities available in the libraries. These ICT facilities covers all forms of computer and communications equipment and software used to create, design, store, transmit, interpret and manipulate information in its various formats which could be used to mitigate global warming. Personal computers, laptops, televisions, and network technologies are just some examples of the diverse array of ICT tools made available in the libraries to provide relevant information to fight global warming.

The use of ICTs in combating global warming cannot be underscored since ICT enables optimum use and sharing of resources among individuals thereby reducing the operational costs and provide them with relevant information to satisfy their needs quickly and easily. As such,

Akinyemi and Afolabi (2023) stressed that the use of ICT in libraries has made information services easier for library personnel in the essence that it saves time, allows multiple users at a time, reduces space allocation, and provides access to information within and without library walls to fight global warming. Application of ICTs is an advantage for both the library personnel and the library users. Through ICT devices, large volumes of data or information are stored in a very compressed space which enables users fast and easy access to information resources to mitigate the menace of global warming in Nigeria at the right time.

ICT enables libraries to concentrate on other tasks such as research and consultancy to provide opportunities to deploy innovative methodologies to meet the dynamics needs of community seeking information to combat global warming. Consequently, Gabriel (2020) posits that the use of ICT resources in Nigeria has become increasingly very significant in retrieving and storing information related to global warming. ICT based resources and services enable the libraries to render services at accelerated pace. This is made possible through the use of web based resources and a variety of other ICTs by complementing the traditional methods of librarianship

that is characterized with prints collections and manual service delivery. To buttress this point, Benson (2016) explains that the use of ICTs by individuals or community have made research easier and interesting to fight global warming.

Concept and Significance of Information and Communication Technology in Combating Global Warming

The concept of Information and Communication Technology (ICT) has been defined by different scholars in different perspectives. Adeleke and Olorunsola (2010) defined ICT as the incorporation of the range of technologies which includes computers and its associated components, communication technologies etc. that can be used to access, store, retrieve and disseminate information. This definition shows that, the concept of ICT involves the set of technologies which can be used in the libraries to acquire, store, retrieve and transfer the information to combat global warming. However, Essien, Abredu and Zotoo (2022) describes Information and Communication Technology as the use of computer system and telecommunications in the delivery and handling of information services. They identified three basic components of information and communication technology as electronic processing using the computer; transmission of information using telecommunication equipment and dissemination of information in multimedia. information and communication technology are those technologies that are used in handling, acquiring, processing, storing and disseminating information. Therefore, Information and communication technologies (ICTs) enhance the quality of research which its findings could be used to combat global warming in Nigeria.

According to Oghenetega, Umeji & Obue, (2014) Information and communication technology (ICT) is the application of computers and other technologies to the acquisition, organization, storage, retrieval and dissemination of information. However, in this context, information and communication technology is the use of electronic devices such as computers, telephones, internet, satellite system, to store, retrieve and disseminate information in the form of data, text image and others. Thus, Scanlon (2012) posited that there has recently been intense interest in the ways in which technology can be used to support research to fight global warming. It should be noted that with the world moving rapidly into digital media and information, the role of ICT in combating global warming is becoming more and more important.

Causes of Global Warming in Nigeria

The causes of global warming in Nigeria can be categorized into two: - natural and man-made causes (Crowley, 2018)

(a) Natural causes

The earth's climate is grossly influenced and changed through natural causes such as ocean current, volcanic eruptions, the earth's orbital changes and solar variations

i) Ocean current

The oceans have been shown to be the major component of the climate system. Ocean currents move vast amounts of heat across the world. Wind push horizontally against the sea surface and drive ocean current patterns. Interactions between the ocean and atmosphere can also produce phenomena called El- Nino which occurs

every 2 to 6 years. It has been shown that deep ocean circulation of cold water moves from the poles towards the equator and warm water from the equator back towards the poles. Without this movement the poles would be colder and the equator warmer. The oceans play an important role in determining the atmospheric concentration of CO2. Changes in ocean circulation may affect the climate through the movement of CO2 into or out of the atmosphere (Brown, 2010)

ii) Volcanic activities

Volcanic eruptions are known to throw out large volumes of sulphur dioxide (SO2), water vapour, dust and ash into the atmosphere. It is known that large volumes of gases and ash can influence climate patterns for years by increasing planetary reflectivity, causing atmospheric cooling Tiny particles called aerosols are produced by volcanoes. Because these reflect solar energy back into space, they have a cooling effect on the earth's surface (Perkin.2010).

iii) Earth's orbital changes

The earth makes one revolution around the sun once a year, tilted at an angle of 23.50 to the perpendicular plane of its orbital path. Changes in the tilt of the earth can lead to small but climatically important changes in the strength of the seasons, more tilt means warmer summers and colder winters; less tilt means cooler summers and milder winters more heat.

(b) Human causes

Onoja, Dibua and Enete, (2013) observed that climate is changing due to man-made greenhouse gases from burning fossil fuels for electricity, cars, trains, aircrafts, homes, flaring of gas at the oil fields and deforestation.

(i) Burning of Fossil fuels

The components of fossil fuels are oil, coal and natural gas. The actual combusting of these components causes excessive carbon dioxide to flow into the atmosphere, thus, causing pollution of the atmosphere which inevitably results into global warming.

(ii) Gas Flaring

Gas in this content relates to the associated gas in oil production process. This associated gas could be harnessed to the benefit of the country when employed for domestic use and export. Unfortunately, in Nigeria, associated gas is extravagantly flared into the atmosphere, channelling ways for climate change to surface.

(iii) Deforestation

This is a process of clearing of forests, by cutting down or burning all the trees grown in such forest. Nigeria also leads the world in deforestation as the thick forests have been wantonly cleared for logging, timber export, wood fuel and agriculture. Sadly, these trees which are cut down serve as a major absorbent of carbon-dioxide (C02) through the process of photosynthesis. Thus, by the reckless removal of trees for economic and domestic utilization the atmosphere is substantially deprived of the instruments which should protect it against carbon-dioxide (C02) effects. A major effect of deforestation is desertification.

As such, Perkin (2010) stressed that the main cause of global change in Nigeria has been attributed to high concentration of greenhouse gases (GHGs) in her atmospheres. The excessive emission of these GHGs causes the atmosphere to be in a polluted state.

Effects of Global Warming in Nigeria

When climate change surfaces, there is a sudden change in health condition, rainfall patterns, wind patterns and also increase in temperature amongst others which result inevitably to natural disasters like flood, drought, desertification etc.

(i) Health Condition

Global warming affects human health directly or indirectly. According to the World Health Organization, global warming is expected to cause approximately 250,000 additional deaths per year between 2030 and 2050. As global temperature rises, so do the number of fatalities and illnesses from heat stress, heat stroke and cardiovascular and kidney disease. Omoruyi and Onafalujo explained that, one of the direct consequences of global change in Nigeria includes cerebraspinal meningitis, cardiovascular respiratory disorder of elderly people, skin cancer, high blood pressure, malaria, cholera and child and maternal health issues.

However, Onoja, Dibua and Enete, (2013) stressed that IPCC report of 2017 has succinctly identified the most effect global warming such as changes in conditions, temperature, rainfall, humidity, and wind likely to alter the intensity and geographical distribution of extreme weather events, raise water levels in coastal regions, alter the distribution of vector insects and mammals, exacerbate health relevant air pollution, intensify the existing burden of malnutrition, and increase human exposure to toxic substances due to the deterioration of natural and man-made environment (Graciano, 2010).

Types of ICTs available in Libraries to Combat Global Warming

According to Gabriel (2018) Information and Communication Technology (ICT) can be broadly classified into the following types and attributes:

Communication Technologies: These are equipment that enable information to be transferred from the source to user. It also tries to overcome natural barriers to information transfer like speed and distance. Some of these include: facsimile machine (fax), telecommunication system, telephone, electronic mail, teleconferencing, electronic bulletin board among other. These technologies could be provided by libraries for use among users to retrieve information related to global warming.

Display Technologies: These are output devises that form the interface between the sensing, communication and analysing technologies and human user. They include computer screen, printer, television among other. Therefore, computers could be used by library users to generate and store and use information to fight global warming.

Analysis Technologies: These are the methods that assist in data investigation or question, study and in-depth inquiry for answers in testing procedures for basic to complex phenomenon. A micro, nano, mainframe or super scamper could be a complete ensemble of computer devises use to generate and store information that could be important in dealing with the global warming.

Digital archives: are an essential resource for researchers, scholars and other information seekers who must access primary materials for their research in various areas including global warming.

Library websites: A medium of communication for libraries to their users. It is also used to promote the library and publicise it to provide information on politics, socio-economic, culture, climate change among others.

Databases: *Databases* are collections of information that are organized and searchable. Libraries subscribe to *databases* for their patrons, providing access to information on various areas.

However, Osunda (2013) stressed that the following are the types of ICTs available in libraries.

Computer: This is one of the most dramatic advances in communication, potential data communication. They often found in libraries to assist information seekers to retrieve information to fight global warming. Since the first development of the modern electronic digital computers in the 1940s, computerization has infiltrated almost every society.

Internet: - This means international networks; the use of internet has revolutionized access to information dissemination and retrieval in libraries and educational centers. Individual believed that it is an important tool for global information retrieval and it plays a vital role in combating global warming.

CD ROM: may be a pre-pressed optical disk that contains information. The name is Associate in nursing word form that stands for "Compact Disc Read-Only Memory". Therefore, CD ROMs are used to store information to foster research in bringing solutions to global warming.

Online Sources: Online sources are materials that are available online. It will be a web newspaper, magazine or television website such as NBC or CNN. Peer-reviewed journals, Web pages, forums and blogs are also online sources. These are very useful ICT resources which many libraries are now making available to provide information related to climate change and other human day to day activities.

Use of ICTs available in Libraries in Combating Global Warming

Samuel (2014) posited that there has been intense interest in the way in technology is used to support research in day to day human activities. It should be noted that with the world moving rapidly into digital media and information, the role of ICT in mitigating global warming is becoming more and more important. According to Springer (2017) now a day, all schools, colleges, universities and other research institutes are using information and communication technology to store, retrieve and

disseminate information to promote research activities. With the help of this, research institutes strive to retrieve information for fighting against the menace of global warming.

However, Ardies, Gijbels & van (2016) observed that ICTs may also be used to replace the traditional library services delivery in universities and traditional classroom lecture. A number of courses are being developed in which portions of the course or the entire courseware offered via the internet. The instructor may place course notes on web pages, may create a video recording of a live lecture for viewing on the internet, or use combinations of these ideas. Loundon (2015) discussed several methods of preparing courses for the internet including facilitating the use of video clips on web pages as well as the use of forms and other graphics on web pages. ICTs like internet is now widely used as a medium of communication among researchers to combat global warming. For instance, Stephen (2016) reported that most of the links between universities home pages were associated with information about research on global warming.

In the same vein, Springer (2017) opined that internet and computer usage has impacted positively on critical thinking, problem solving, prompt feedback and networking. The strength of internet lies on the unprecedented growth of its network world wide and its ability to connect computers and several individuals without the barrier of geographical space. The use of the internet in fighting against global warming allows a wide range of international resources to be accessed. Resources can be very well organized on the internet, which allow for easy information access and exchange (Simon, 2017).

However, Ashra and Bisht (2015) stressed that one of the most basic uses ICTs in libraries by information seekers is to search for sources and information to complete research activities to mitigate the effects of global warming. The network`s ability to provide information seekers quick access to scholarly publications to retrieve information help to address the effects of global warming.

Challenges Associated with the use of ICTs available in Libraries in combating Global Warming

While new technologies have added value to provision of information and library services by presenting new modes of collecting and retrieving information. These technologies have brought new challenges and aggravated some of the challenges that faced libraries before (Oghenetega, Umeji & Obue, 2014). Thus, Oghenetega, Ebele and Nkechi (2018) identified the following challenges associated with the use of ICTs.

Poor maintenance culture

Most of the equipment procured for the information technology was purchased from foreign countries and as a result of the nation’s backwardness. In the use of ICT facilities, they lack information and experience library personnel to effect repairs on the system during breaking down. Also when complains are passed to higher

quarters or the government for consideration it goes through as long bureaucratic process, which in turn may affect their frequent use to mitigate climate change.

Poor networking

When facilities are reluctantly switched on, the rate of downloading information are normally slow and in most case foil, when information is being shared from a far network. This could frustrate library users searching for information related to global warming.

Environmental and Climate Problems: Environmental and climatic problems are compounding the problem of the effectiveness and efficiency of ICT to combat global warming. Certain geographical locations are difficult to locate networks, especially in some areas where libraries are established, and climatic conditions of a given area will predispose it to clarity of network in ICT programmes. Stormy weather may bring about serious destructions to telecommunication masts and antennae, which may require time and money to replace.

Erratic power supply

Effective use of information and communication technology in libraries to fight global warming depends largely on effective and constant power supply. This is so, because cannot function effectively. It is therefore necessary that the institution or external system that wish to operate these technologies should make adequate provision for constant electricity supply since the electricity corporation (NEPA) now known as PHCN has become so epileptic. A generating set should be made available to supplement (PHCN) irregular supply.

Illiteracy

There is no gain saying the fact that illiteracy affects the effective use of information and communication technology (ICT) available in libraries. This ascertain is evident in the fact that some information seekers have little or no idea about these modern technologies and because of their lack of awareness they tend to discard it use on the ground that these technologies can be done electronically, they can also be done manually. It is therefore imperative that these set of people should be given lesson on how operate and use these technologies for combat global warming.

Conclusion

Global warming is a problem which directly affects human life and destroys property. It brings changes in conditions, temperature, rainfall, humidity, exacerbate health relevant air pollution, intensify the existing burden of malnutrition, and increase human exposure to toxic substances due to the deterioration of natural and man-made environment. Such effects caused by global warming could easily be managed and mitigated with the use of ICT facilities acquired and made available for use by libraries.

Recommendations

1) Sufficient fund should be provided to libraries on regular basis for the provision of relevant and current ICTs gadgets that provoke the interest of 21th century and to members of community for use to mitigate global warming.
2) Relevant and current ICT facilities should be provided frequently by libraries to information seekers so as to retrieve relevant information to control global warming.
3) Uninterrupted internet access and other relevant ICT facilities should be provided by libraries particularly public libraries for effective service delivery to meet the information needs of the users by providing them with information about global warming, its causes, effects and measures taken to mitigate its menace.

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