CLOUD COMPUTING APPLICATION AND OFFLINE DATABASE PROVISION AS CORRELATES OF EFFECTIVE SERVICE DELIVERY IN UNIVERSITY LIBRARIES IN NORTH-WEST, NIGERIA

By

MUHAMMAD, Abdulmuminu

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DEPARTMENT OF LIBRARY AND INFORMATION TECHNOLOGY,
SCHOOL OF INFORMATION AND COMMUNICATION TECHNOLOGY,
FEDERAL UNIVERSITY OF TECHNOLOGY
MINNA, NIGER STATE

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ABSTRACT

This study investigated the cloud computing technology application and offline database provision as correlate of effective service delivery in three federal university libraries in northwest Nigeria. The study adopted descriptive survey research design with a population of 177 and sampling size of 177 e-librarians and library ICT staffs. Total enumeration sampling technique was adopted considering the population. The research instrument used was questionnaire and observation checklist, the research used SPSS statistical software for the data analysis. Six research question guided the study in three selected federal university libraries. The data collected were analysed using descriptive statistics of frequency table, percentage and mean scores while correlation analysis was use for the hypotheses. The finding of the study show that all the ICT facilities were available in both the three selected university libraries studied, It has been revealed from the study that despite the availability of ICTs facilities, not all the cloud computing services and offline databases observe by the researcher were available although the availability of offline database is more than that of cloud computing in the selected three university libraries. It has been deduct from the study that the e-resource found on cloud computing and offline database are mostly e-books, e-journals, and e-theses. It has been noted that inadequate funding of library electronic facilities and services, Epileptic power supply, lack of dedicated server in the library, Inadequate security measures, Inadequate computer to access the e-resources, Inadequate bandwidth to sustain internet services, limited number of available e-books, limited number of available e-journal, and Insufficient number of cooling systems are the factors affecting cloud computing application and offline database provision in the library. The study therefor, recommended that the government and university management should implement and make remarkable policies that will lead to the cloud computing application and offline database provision in the library and the library management should make policies that will ensure the implementation and the use of such gadget for effective library service delivery.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

Academic libraries are libraries established in Polytechnics, Monotechnics, Colleges of Education and Universities, to take care of the information needs of students, lecturers, researchers and other community of scholars. University library services are rendered to support the teaching, learning and research activities of their parent institutions. The university library being an integral part of an academic institution is saddled with the responsibility of providing print and electronic information resources to support the vision and mission of the parent institution. Sobalaje *et al*, (2011) posit that federal university libraries continues to bring man in contact with the word in the fulfilment of its function as a repository of knowledge in all forms and shapes. According to Yacom (2011) academic libraries are also widely acknowledged as centers to the provision of information resources that empowers the educational institutions to produce highly resourceful people to impact positively on national development and academic excellence among nations, including Nigeria.

Libraries have shifted their attention to developing human capital as a key to addressing the information needs of their clients especially in this era of information overload and technological advancements by enhancing effective library services, (Amoah and Akussah, 2017). Service has been defined differently by various authorities among which are marketing experts in library and information professionals who viewed services as resources, commodity or activity that can be transferred from an individual, cooperate body or an organization to another. Corroboratively, Lovelock and Wirtz (2011) acknowledge services as the economic activities offered by one party to another.

Similarly, Kotler and Armstrong (2012) defined service as an activity, benefit, offered for sale that is essentially intangible and does not result in the ownership of anything. From the definitions above, service is an activity that is being offered by an individual, organization, corporate body to another by giving them the needed sources. So, service should be defined in their own term, not in relation to goods. Effective service as described by Udensi and Akor (2014) is "the standard in the library that can best be determined by looking at library resources capability and utilization, meaning that the effectiveness of the library services can only be judged by its collections, facilities and staff performance". The authors were of the opinion that the services with high degree information and research needs of faculty, students and other users can contribute to the success of educational and developmental goals of the institution in an effective manner

Library services are day to day activities offered by the university libraries to meet the information needs of the users'. This can be rendered in direct or indirect ways. Direct services are those offered to users through direct contact while indirect services are the behind the scene activities rendered by the library staff. Example of library services are research support and bibliographic searching, acquisition, information organization, Online Public Access Cataloguing (OPAC) "is an online database containing bibliographical information material held by library or group of libraries for easy searching and retrieval of such information material in library", Internet, electronic resources, Current Awareness Services, (CAS) "is referred to as dissemination of information that will keep users well informed and up to date in their field of interest as well as their related subjects and disciplines", binding, training, referencing services, printing, photocopying, recreation, bibliotherapy "refers to the use of literature to help people cope with emotional problems, mental illness or change in their lives", circulation, audiovisual, Selective Dissemination of Information (SDI) "refers to tools

and resources used to keep a user informed of new resources on specified topics", digitization, mobile library, social media, makers spaces, virtual reality, data management, readers services, artificial intelligence chat, cloud computing technology and offline database provision.

Some of the core challenges of libraries in this 21st century include innovation for effective services delivery that will meet with the users' needs. Ward (2015) noted that application of cloud computing technology in academic library has brought an inevitable change in face of libraries in terms of effective service delivery. This involves data storage, resource sharing and collaboration within the libraries. Cloud computing technology is an Information Technology (IT) based system and it is known to be the third revolution after Personal Computer (PC) and Internet in information technology (Dillon *et al*, 2010). One of the fundamental ways of enhancing library services in the 21st century is via cloud computing technology. Sahu (2015) opined that cloud computing can transform the way systems are built and services are delivered, providing libraries with an opportunity to extend their impact. For decades, libraries have existed exclusively as physical spaces, but with the advent shift from manual to offline and online contents which implies that libraries have to take steps to better meet it community information needs, provide computer access, subscription to academic databases online and offline, trained assistants to help the users navigation in search for qualitative and well researched information. Thus, the importance of cloud computing service delivery cannot be over emphasized. Libraries should therefore make a move from the physical to virtual

Cloud computing works on a principle of resource sharing and infrastructure for effective and efficient service delivery. Such include the provision of software as a service with the essential hardware resources used as a virtualized platform across

numerous number of host computers, connected to the Internet or an institution's internal network, Nie *et al* (2013) stressed that it has brought a great change in library and information service provision which was badly lacking in last decade so the cloud computing technology has gradually caught the attention of the library world. The United State of America, Department of Commerce's National Institute of Standards and Technology (2011). Defined cloud computing as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction, with web 2.0 enabling services handling the hardware and software needed to support institution accounts (Huth and Cebula, 2011). It is the service to be used as privates or public for day-to-day tasks, which simply requires a web browser, a smart device, or any Internet enabled devices, and an access to a registered account.

Cloud computing provides new opportunities for innovation and offers unprecedented new levels of configurability for diverse groups of users of which the library is not left out. It also creates possibilities for services to be dynamically configured to the needs of each user with a single unification service, usually global-scaled architecture. Cloud computing delivers services incorporated in data storage, computation (processing power), and networking. That is, sharing of data storage, computing power, and network infrastructure by multiple user groups. Cloud services can be provided to the clientele at any time, regardless of distance and location, with the cost based only on the resources used. Users or subscribers only need to acquire from the providers the 'amount of computing' required without needing to invest in the entire computing infrastructure (Kushida, *et al*., 2011).

Considering inadequate funding facing Nigerian university libraries, there is need for the library to embark on offline databases provision in the library for effective service delivery. In a case where subscription, local area network and wireless network bandwidth may be a challenge, offline database can serves as notable collection of electronic resources that is organized, stored, updated for easy access and retrieval. Usman *et al,* (2018), opined that Offline information content is recognized as prominent electronic databases for searching the latest literature conveniently without internet connectivity. To address the ever increasing demands of current and relevant information by 21st Century library clientele, academic and research libraries must embark on the provision of large number of offline databases to suit the interest of new technology library users. Searching information in an offline database is easier, faster, less time consuming, user friendly and above all enable access to information which otherwise would not have been available because of geographical or financial restrictions. The offline database include CD-ROM, CD, DVD, HARD DISC, Computer Server, E-Granary, TEEL, and VHS tapes. They are used to store information share the information, content through intranet connectivity and retrieve the needed information any time within twenty four hours round the clock 24/7.

Offline database is conceived as electronic platform that is searchable without internet connectivity, they provide effective service to the user community, such offline database contain electronic resources (e-resources) that comprises of e-books, e-journals, e-articles, e-theses and dissertation, e-conference paper and lecture notes. Offline databases contain the collections of electronic information resources by publishers from various fields and disciplines which can be accessed offline (Kwadzo, 2015). Such as e-books and e-journal that can be access with or without network. The databases collection are categorized into textual, numerical, bibliographic and non-

bibliographic, offline (Hendeson, 2010). The information resources found in offline database can be inform of text, number, character, diagram or picture.

The need for cloud computing and offline database emerged due to the information explosion problems in accessing the information, saving the time of the users and staff, resource sharing problems in the library. According to Mavodza (2013), libraries are using cloud computing technology for putting together library resources, that is, by using Software as a Service (SaaS) in library catalogues, WorldCat, Googledocs, and the aggregated subject gateways, the web platform as a service (PaaS) as in the use of google appengine, or infrastructure as a service (IaaS) as in the use of D-space, green stone and FEDORA. The cloud is confirmed as a facilitator in storing, accessing and retrieval of information. While offline database is recognized as prominent electronic databases for searching the electronic collection conveniently without internet connectivity (Usman, 2018). In addition to providing a unified web presence with reduced local storage capacity challenges. The storage-as-a-service: (also known as disk space on demand), is the ability to leverage storage that physically exists at a remote site but is logically a local storage resource to any application that requires storage (Ganore, 2013), the database-as-a-service: (DaaS) provides the ability to leverage the services of a remotely hosted database, sharing it with other users and having it logically function as if the database were local. Different models are offered by different providers, but the power is to leverage database technology that would typically cost thousands of dollars in hardware and software licenses (Ganore, 2013).The software as a service (SaaS) offers finished applications that end users can access through a thin client (typically, but not necessarily, a web browser).

The applications are released for use, consumers do not have control over the service which employs a multi-tenancy system architecture, applications are organized into a

single logical environment on the software as a service (SaaS) to achieve economies of scale and optimization in terms of speed, security, availability, disaster recovery, and maintenance (Dillon, *et al*, 2010).

Some of known providers include Gmail, and Google Docs. Other examples of SaaS include Google Apps, Microsoft Office and also platform as a Service (PaaS) which offers an operating system as well as suites of programming languages and software development tools that customers can use to develop their own applications, PaaS offers a development platform that hosts both completed and in-progress applications (Dillon, *et al*, 2010). The major prominent providers of platform as a service (PaaS include: Amazon Elastic Beanstalk, Cloud Foundry, Force.com, Google App Engine, Windows Azure Compute and Orange Scape. The infrastructure as a Service (IaaS) offers end users direct access to processing, storage and other computing resources and allows them to configure those resources and run operating systems and software on them as they fit to serve as either online database or offline database.

Historically from the beginning, computer technology and networking have brought an abundance of new technology invention to libraries, and have made a significant impact on education, training, and human resources management (Enis, 2015). Academic libraries' associate with cloud computing can be seen as the nascent relationship between the hosted services with commercial library vendors, those vendors started to make resources available, over the web (cloud) in the 1990's, those services included full text library databases mostly comprised of books, articles and journal e-resource materials.

Following the current trend, technology have changed services to cloud based ones, whereby libraries subscribe to the cloud databases, however, this is starting to be

expanded into library catalogues, discovery tools, and multimedia (Preedip and Krishnamurthy, 2013). The discovery tools such as ExLibris's Primo can be purchased either as a cloud service or locally hosted, the main advantage of the cloud version is the cost saving in terms of computer hardware. The cloud version comes in two varieties, first one is just hosted and the client does maintenance, customization, and install the software updates, the other option is fully maintained and updated by ExLibris but is a lot less customizable (http://www.exlibris.com). Online Computer Library Centre (OCLC) has brought out a multi-tenant Library System called World Share which is cloud based. This brings together a few of the already successful tools for libraries such as World Share Interlibrary Loan and wrapped them into a unified environment based around the features of a traditional library system such as cataloguing, acquisitions, and Online Public Access Catalogue, (Bowers and Polak, 2014). See appendix A, for Sample Library System Vendors with Cloud Services.

The provision of robust wireless networks in academic libraries has been essential to help provide cloud based tools such as Google Docs, Dropbox, as well as access to library services that are cloud based, (Lagarde and Johnson, 2014). There is need for current library services to be system friendly for users of library tools such as the offline database provision. Offline database were in existence in libraries for a very long period of time, computerized database started early 1960s, in CD-ROM format, since then there has been a tremendous growth in the number and scope of databases, Worldwide, there are no accurate statistics for the total number of databases in existence (Muhammad and Binta, 2017). Electronic databases are valuable tools for study, learning and research for economic development. It provide many advantages over traditional print-based resources, they contain current information because they are updated frequently, they offer advanced search capabilities, they offer flexibility in the

storage of the results, and they enable access to information without the restrictions of time.

With growth in technology, libraries are using cloud computing technology and offline databases for enhancing library services by adding more values, attracting the clienteles, the new concept of cloud and libraries has generated a new model called cloud libraries (Abidi and Abidi, 2012). Though the usages of cloud computing and offline databases may vary with the library's nature, but most common usages are for the effective library service delivery.

1.2 Statement of the Research Problem

The advent of Information and Communication Technology has significantly transformed the nature of service delivery in various sectors including the library systems. With the modern technology, many information resources are now published, acquired, processed, organised, accessed and disseminated electronically thus, the need for cloud computing application (Comfort, 2018). Also, the interest and preference of modern library users for electronic information resources over the printed materials is a challenge to university libraries toward providing the right information in a right format to the right user at the right time using internet connectivity.

In addition the provision of offline databases which do not require Internet connectivity has been adopted by many university libraries in order to achieve effective service delivery. Most electronic sections of the university libraries provide offline databases which provided opportunity to the clientele to access and retrieve the needed information at ease thereby enhancing the service delivery of such library.

However, it has been observed that many university libraries in Nigeria have not been able to provide effective services due to underfunding which has been adversely

affecting the maintenance or sustainability of cloud computing application. With this development, many university libraries have not been able to subscribe to current and relevant information resources and the hosting of the cloud computing. Similarly, the offline databases provision which should be supplementing the cloud computing application is also affected by lack of updating the available resource due to poor finance.

In view of the foregoing, it is certain that effective service delivery in the university libraries will be difficult to provide in a situation where the application of cloud computing and offline databases provision cannot be adequately sustained. Therefore, this study investigated cloud computing application and offline database provision as correlates of effective service delivery in university libraries in North-West, Nigeria.

1.3 Aim and Objectives of the Study

This research investigated cloud computing technology application and offline databases provision as correlates of effective service delivery in federal university libraries in North West, Nigeria. Specifically the study was designed to:

1. identify the ICT infrastructure facilities available in federal university libraries in North West, Nigeria for effective service delivery,
2. determine the cloud computing technology service use in federal university libraries in North West, Nigeria, for effective service delivery
3. identify the types of offline databases provided by the federal university libraries in North West, Nigeria, for effective service delivery
4. find out the type of electronic information resources found on cloud computing technology and offline database provided in federal university libraries in North West, Nigeria, for effective service delivery

5. identify the factors affecting cloud computing application in federal university libraries in North West, Nigeria, for effective service delivery
6. identify the challenges facing offline databases provision for effective library service delivery in federal university in North West, Nigeria for effective service delivery.

1.4 Research Questions

This study answer the following questions:

1. What are the available ICT infrastructure/facilities in federal university libraries in North West, Nigeria for effective service delivery?
2. What are the cloud computing technology service use for effective service delivery in federal university libraries in North West, Nigeria for effective service delivery?
3. What type of offline database provided by the federal university libraries in North West, Nigeria for effective service delivery?
4. What types of electronic information resources found on cloud computing technology and offline database provided by the federal university libraries in North West, Nigeria for effective service delivery?
5. What are the factors affecting cloud computing application for effective service delivery in federal university libraries in North West, Nigeria for effective service delivery?
6. What are the challenges facing offline databases provision for effective service delivery in federal university libraries in North West, Nigeria for effective service delivery?

1.5 Research Hypotheses

The following null hypotheses were formulated and subjected to statistical test at 0.05 level of significance:

H_{O1}: There is no significant relationship between the cloud computing technology service and effective library service delivery in federal university libraries in North West, Nigeria.

$H_{O2:}$ There is no significant relationship between offline database provided and effective library service delivery in federal university libraries in North West, Nigeria.

$H_{O3:}$ There is no significant influence on effective library service delivery in federal university library in North West, Nigeria.

H_{O4}: There is no significant difference between application of cloud computing and offline databases provision for effective service delivery in federal university libraries in North West Nigeria.

1.6 Significance of the Study

The finding of this study will be of benefit to the Federal government of Nigeria, States government, University management, library management, researchers, writers, postgraduate and undergraduate students. As it provide concrete knowledge on the application of cloud computing technology and offline databases provision in federal university libraries. Showing to them the level at which the federal university libraries are using cloud computing and offline databases for effective service delivery, which will encourage government to venture or sustain the provision of cloud computing and offline database resources and services to the university libraries in Nigeria. The outcome of the study will also provide information to the government and library management in a way that it will reveal to them, the benefit and effectiveness of the

service provided by using cloud computing technology and offline database, in meeting the information needs of the users, and consequently encouraging them towards working out necessary method to improve the functionality of cloud computing technology and offline databases provision in the library management system.

The research will also help to reveal the extent to which cloud computing technology and offline databases provision is to be applied in federal university libraries in Nigeria as it will highlight the stage of application of cloud computing technology and offline database provision in the federal university library in North West, Nigeria. The finding will lead to a better library services for the fulfilment of the objectives and goals in providing easy access to information and utilization. The finding of this study will be useful to academics and management of academic institutions in their research. The finding will also serve as important tool for knowledge improvement and contribution to knowledge on application of cloud computing technology and offline database provision. The study will help in bridging the gap where such services have been provided but are not effective by enabling the provisions of the necessary policies so as to improve the functionality of the system. The finding of this study can be used as reference by the government, researchers, and writers and thus contribute significantly to the literature of library and information technology/library and information science as it highlight the level of cloud computing application and offline database provision in three selected federal university in north west Nigeria studied.

1.7 Scope of the study

This research work, focused on application of cloud computing technology and offline databases provision in relation to effective library service delivery. The study also cover e-librarians and library ICT staff in federal university libraries in North-West, Nigeria, including: Kashim Ibrahim Library Ahmadu Bello University Zaria Kaduna State,

Bayero University Kano library Kano State and Abdullahi Fodiyo Library Usmanu Danfodiyo University Sokoto Sokoto State in North west of Nigeria.

1.8 Operational Definition of Terms

The following terms have been defined according to their usage in this study.

Academic libraries: Libraries operated in polytechnics, mono-technics, college of educations and universities in Nigeria.

Cloud computing: Integrated networks of computing that offers cloud based networking environment, for processing, storage of shared networks, and other fundamental computing resources.

Effective service: physical attractiveness, relevance of available resources, adequacy, accuracy, timeliness, remote access and friendliness of the available electronic resources, hours of operation, reliability, responsiveness, assurances and ease of accessing library electronic resources used by the federal university libraries in North-West, Nigeria

Offline database: Collection of electronic resources that are organised, stored, updated, for easy accessed and retrieval, without internet connectivity

Services: Cloud, offline database subscription, provision of electronic resources, bibliographic searching, OPAC, e-library, digitization, maker space and reference activities rendered by the library for effective service delivery

Staff: Personnel, people or librarians working in federal universities library in North-West, Nigeria.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Conceptual Framework

Figure: 2.1 below is the diagrammatic presentation of relationships among the construct or independent variables cloud computing and offline databases and the dependent variable effective service delivery.

Conceptual Model of Variables

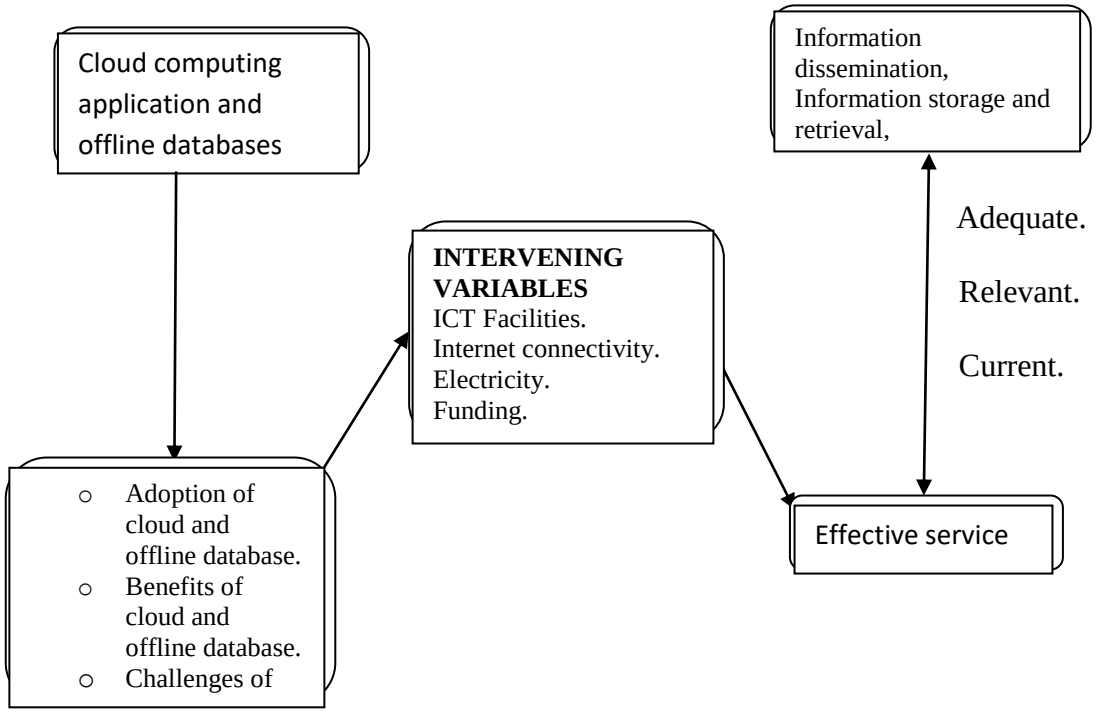


Figure: 2.1: Author's Research Construct, 2019.

The model describes the independent variables as the application levels of cloud computing and offline databases provision. Therefore, the independent variables can only make an impact when intervening variables are in existence. The intervening variables are ICT facilities, electricity, Internet and Intranet connectivity. The combination of both independent and intervening variables may influence the impact on

the dependent variable which is effective service delivery. The dependent variable is the library service such as information dissemination, information storage information retrieval, and information sharing among federal university libraries. In this case, application of cloud computing and offline databases provision can only be achieved when both independent, intervening and the dependent variable work together in a kind relationship.

In other words, the schema relationship between the various variables in this study. The measurable aspects of the application levels of cloud computing and offline databases provision constitute the independent variables. As an intervention strategy, this study explores the contribution of Internet and intranet connectivity, electricity supply, information and communication technology (ICT) facilities and funding as the intervening variable. Success in cloud computing and offline databases is dependent on the perception and the implementation strategies adopted. Application of cloud computing and offline databases provision for effective library services among librarians would bring about more linkages and exposure that would eventually result into an enhanced and effective library services.

2.2 The Concept of Cloud Computing and offline database

A lot of studies have been conducted on the application of electronic resources by libraries in developing countries, including Nigeria, much of which revealed that the libraries in the developing world have come to appreciate the importance of information available through the international information system. However, they have not been able to take full advantage of these facilities (Muhammad and Binta, 2017). Cloud Computing is technology that is used to access different services on the Internet such as **private cloud internet service**, **public cloud internet service**, **community cloud internet service** and **hybrid cloud internet service**. Cloud computing is technology

model in which all resource application software, processing power, data storage, backup facilities, development tools are delivered as a set of services via the Internet (Tambe and Hitt, 2013).

Khan and Galibeen (2011) provided the concept of cloud computing and also highlighted how libraries can benefit using cloud computing technology by providing resource sharing and collaboration between libraries. The pressure from users to adopt new technologies causes librarians to look more closely into cloud computing technology (Srivastava and Verma., 2015). Emerging Trends and Technologies in Libraries and Information Services, (2015) note that, the primary purpose of academic libraries is to support teaching, learning and research of the parent institute, with consistent and supportive of the institutions mission, vision and national development.

Library resources and services should be sufficient in quality, depth, diversity and currency to support institutions curriculum. As a result of that academic libraries are often considered the most important resource center of an academic institution (Emwanta, 2012). For information to be at the disposal of every one, there must be adequately equipped library and well-packaged information services delivery.

It is therefore necessary that adequate and appropriate library resources and services should be made available through cloud computing technology and offline databases provision to clientele in support of their intellectual, cultural and technical development needs, as observed by (Akpan-Ataha 2013). Michael, *et al* (2010), defined cloud computing as the applications delivered as services over the Internet and the hardware and systems software in the databases or data centers that provide those services.

Offline database has become a sign of the modern age and is invaluable tool for teaching, learning and research (Sethi and Panda, 2011). 21st century, advancement of

computer and networking technologies had revolutionized information need and access across the planet in a systematic ways and format. The resources found in offline databases include: e-books, e-journals, e-magazines, e-learning tutors, e-discussions, e-news and data archives can be accessed through computer. Ibrahim and Usman (2013), pointed out that scholarly databases are form of bibliographic databases that are dedicated to specific academic disciplines, subjects, issues and areas, such offline databases include: CD-ROMs, E-Granary, ZIP-DRIVE, CDs and DVDs or remotely via network such as the intranet on computer server. Usman *et al* (2018), posited offline databases are conceived as a resource that is searchable without internet connectivity which is stored in a computer work station (server), CD ROMs, internal or external hard disc that allows sharing of information locally or through library platform. Electronic resources, consists of materials that are in electronic form controlled by computer hardware and software, including materials that require the use of peripheral like CD ROM/DVD player (International Federation of Library Association, IFLA 2015). It is very easy to search and retrieve information from offline databases in a fraction of seconds as no network connectivity is required. A registered and authorized library patrons are allows to read, and print at his/her convenient time without fear of network failure. (Usman, *et al* 2018). For effective service deliver in the library.

2.2.1 Cloud Computing Technology

Cloud computing technology is an Internet base system, capable of storing, sharing e-resource and creation of collaboration within the interested institution. With the advent of information explosion, libraries are facing challenges in managing their resources. So there is need for migration of library systems from client server to cloud computing. Adegbilero (2017) described library service as web-based, multitenant library systems which operates largely as Software as a Service (SaaS) on the cloud computing

architecture for the unified management and discovery of all kinds of library resources, in addition it integrate workflow approach which incorporates digital processes and thus ensuring libraries efficiency and effectiveness (Grant, 2012).

Breeding (2015) defined cloud as a product that enables libraries to acquire and manage their collections, spanning multiple formats of content, including a minimum physical materials and electronic content which also support multiple procurement processes, including those related to items purchased for permanent ownership, those made available through paid licenses and subscriptions, and those selected from open-access sources. There are many business, cooperatives and organizations who functions as cloud computing vendors for library system, web pages and search engines that offer the use of cloud computing technology. Some of thus are: Ex-Libris Cloud, Duraspace's, OCLC's Webscale, Polaris Library Systems, OSS Labs, they all provide

The functional features of cloud include: management of electronic materials, replacement of multiple incumbent products, extensive metadata management, multiple procurement workflows, knowledge bases and bibliographic service, built-in collection analytics, conceptual organization, and discovery services (Breeding, 2015). Library services are activities, process of acquiring, storing processing, and disseminating information resource to the clientele that can be through online or offline.

2.2.2 Offline database

Electronic databases (e-databases) have become an established component of many academic libraries' collection. With full-text e-books and e-journals for effective information seeking behavior. Most academics libraries now prefer using electronic platform to access information (offline databases) than traditional print indexes and abstracts. The evolution of Information and Communication Technology (ICT) is

dynamic and has affected library services and resources, it transformed knowledge to different dimensions/formats and this culminates into intranet and internet (Hajara. and Olatoye, 2015). Offline database are electronic container, a platform or devices such as hard disc (internal or external), flash drive, e-granary and CD ROMS, DVD and Zip CD containing electronic information to be use in the library or used in the library. Offline databases are created for an organization that manages data to allow easy access, fast storage and retrieval of the information. Offline database can be edited to suit one's purpose or interest (Hajara and Olatoye, 2015). Offline database is an electronic platform or application software for organizing and storing electronic information resource in the library without internet access. Database is a collection of Information organized in such a way that computer program can quickly select desired pieces of data in electronic filing systems, database can be categorized according to various bases like on the bases of online databases and offline databases (Chiang, 2010). These include e-books, e-journals, e- article, lecture note, digitalized primary sources, and conference papers. Muhammad and Binta (2017) affirmed that electronic databases are valuable tools for study, learning and research. It can provide many advantages over traditional print-based resources: they contain current information because they are updated frequently, they offer advanced search capabilities, they offer flexibility in the storage of the results, and they enable access to information without the restrictions of time and location, for effective library service delivery.

2.3 Library Services

Effective service as described by Udensi and Akor (2014), is "the standard in the library can best be determined by looking at library resources capability and utilization, meaning that the effectiveness of the library services can only be judged by its collections, facilities and staff performance". The authors were of the opinion that the

services which satisfies high degree information and research needs of faculty, students and other users can contribute to the success of educational and developmental goals of the institution in an effective manner. Lovelock and Wirtz (2011) opined that service can be viewed from 5 dimensions, namely:

1) Tangibles: refers to physical attractiveness, equipment and materials used by the library, cloud computing and offline database. Tangibility in library service has to do with the conduciveness of the library spaces such as e-library space. Library must be able to provide adequate facilities to enhance teaching, learning and research activities to the institution. Library building must be located at a strategic place possibly at the center of the university the library most do away with any source of distraction service render and it should contain all the information and communication technology needed to deliver it service.

2) Responsiveness: with regard to the willingness and ability of the libraries to meet up the challenge by providing or delivering needed service effectively such services should be deliver quickly without wasting clientele's time.

3) Assurance: The behavior of the library staff that fosters customer's trust towards the library and the library can create a sense of security for patron. Assurance also means that the needed service can be render at the time of it need.

4) Reliability: This refers to the library's ability to provide adequate service repeatedly without making any mistakes and deliver services at the right time". A proper record should be keep in of any miss conception of the resources consulter.

The fifth one is effectiveness. which include ease of access to library resources, such as cloud computing and offline databases ease of use, ease of navigation in library

databases, regular updating of the library databases, adequate bandwidth to access the cloud electronic resources, regular checking of the library electronic resources links, regular information literacy training for library staff and users, uninterrupted power supply, regular subscription to most used electronic resources and adequate Information and Communication Technology (ICT) infrastructural facilities to maximize the use of electronic resources.

2.4 Cloud Computing, offline databases and Nigerian Federal University Libraries

Now that effective library services have been found to be a veritable way for federal university libraries to embrace central offline database and cloud computing, it is imperative that Nigerian academic libraries begin to consider this avenue. Goldner (2012), "libraries can take advantage of cloud computing to get out of technology headache such as hardware breakdown, software problems, staff training deficiency and focus on collection building, patron services and innovation. Geoffery (2013) also added that with the application of cloud computing technology databases in libraries, data can be easily shared among users, and the need for local storage, maintenance and backups will equally be a substitute for libraries. Breeding (2012) pointed out that libraries can also take advantages of cloud computing to build digital libraries/repositories, search library data, host website, search scholarly content, store files, build community power and improve library automation With long history of participation in library computerization and automation migrating to cloud may not pose significant challenge to Nigerian federal universities libraries.

The question pose is that, how soon are they ready to move on from the current library management system (LMS), since not all academic libraries can be said to have fully automated their services in Nigerian federal university. Apagu and Wakili (2015)

opined that most of the research works on ICT in education focuses on the availability of the ICT facilities and the perceptions of the use of thus ICT facilities in the nation`s institutions. The few things that may challenge the application of cloud computing technology and offline database provision are: willing to embark on it and the technology consciousness of library decision makers coupled with the fear of work, funds, management, maintainers and train staff that will be required for migration.

Usman *et al* (2018) stressed that the Offline database resources are for national development and its sustainability in Nigerian. Apparently, the best options to address the poor state of access to research information in Nigerian academic libraries is to think and reconfigure our thinking towards offline databases provision in federal university library for effective library service and its sustainability. In fact, access and use of offline databases would no doubt meet the yearning and aspiration of the new minds set of academic library customers considering the poor state of internet connectivity in Nigeria. With this it can lead the academic library to provide effective service, for quality teaching, learning and research strengthen in our tertiary institutions which in turns promote scholarly culture and sprits that are characterized by stable economic growth, job creations and having crime free society for accelerated national development and its sustainability (Usman *et al.,* 2018).

2.5 Offline databases provision, Cloud Computing technology application, in university library.

The provision of offline database in academic library functions and services have invariably changed the connotation of what an academic library stands for, the current trends defined academic library by function rather than place which is the building (Lucky, and Joy, 2016).

Offline database is a collection of information resource in a format that can only viewed and accessed through the use of ICT facilities. Shariful (2012) described electronic resource as resources that deal with both born electronic and digitized materials which can be either accessible from library's in house database or library platform such include: e-books, e-journals, e-theses, e-articles, conference papers and e-lecture note.

Libraries and their services are associated with Information Technology (IT) on content delivery, communication and collaboration, libraries require server, storage and software in highly demand. Grant (2013) "comprehended the mission of libraries in computing environment and how professionals differentiate themselves from other information suppliers by keeping the values of librarianship intact and preserved when using technology. Stearns and Larson (2011) mentioned that library vendors have started to deliver integrated library systems (ILS) and discovery tools as cloud solutions. According to Mavodza (2013), libraries are using the cloud for putting together user resources that is, using Software as a Service (SaaS), such as in library catalogues, WorldCat, Googledocs, and the aggregated subject gateways, and others such as the use of web Platform as a Service (PaaS), as in the use of Google AppEngine, or Infrastructure as a Service (IaaS), as in the use of D-Space, FEDORA and Greenstone. The cloud is confirmed as a facilitator in storing and accessing information.

Wei *et al*. (2012) discussed the application future of cloud computing in digital libraries, and analyzed the advantages of building the digital libraries on the basis of cloud computing contextually. **Information-as-a-service** is the ability to consume any type of information, remotely hosted, through a well-defined interface such as an API. Examples include stock price information, address validation, and credit reporting (Ganore, 2013). Added that **Process-as-a-service** is remote resource that can bind many resources together, such as services and data, either hosted within the same cloud

computing resource or remotely, to create business processes. You can think of a business process as a meta-application that spans systems, leveraging key services and information that are combined into a sequence to form a process. These processes are typically easier to change than the applications and thus provide agility to those who leverage these process engines that are delivered on demand (Ganore, 2013).

The **Storage-as-a-service:** (also known as disk space on demand), is the ability to leverage storage that physically exists at a remote site but is logically a local storage resource to any application that requires storage. This is the most primitive component of cloud computing and is a component or pattern that is leveraged by most of the other cloud computing components (Ganore, 2013). The **Database-as-a-service: (DaaS)** provides the ability to leverage the services offline and remotely hosted database, sharing it with other users and having it logically function as if the database were local. The new generation of information service for the cloud has many revolutionary features including the user interface of the new generation information system using integrated staff and user (Stearns and Larson, 2011; Yang, 2012). Feng and Bao (2010), studied the applicability of cloud computing in university library system and Zhang et al., (2011) lauded how the model can be integrated into the university library information system. In another similar study Dula and Ye (2012), vividly discussed Pepperdine University Libraries' migration to OCLC's World Share Management Services and the rationale for the decision by focusing on the effects of the new system on the libraries making offline database as backup in case of any challenge.

Dula and Ye (2012) also stressed that, the intricacies of data assimilation; storage, processing sharing, analysis, the process of integration and several such issues depend on which cloud computing service model the library want to deploy, the deployments models define the type of service to access from the cloud and how the cloud is to be

located. Cloud can have any of the four types of access to the client: Private Cloud, Public Cloud, Community Cloud and Hybrid Cloud.

2.5.1 Private Cloud Model

The private cloud model allows systems and services to be accessible within an organization such as offline databases. It is operated only within a single organization. They are deployed in closed environments, maintained and operated for a specific organization (Balan, *et al.,* 2014). This cloud offers more security as it is implemented within the internal firewall.

2.5.2 Public Cloud Model

The public cloud model allows systems and services to be easily accessible to general public. That is, it is an off-premise arrangement from which services are provided. The subscriber does not have physical control over the infrastructure. This type of cloud uses a shared infrastructure pool from which many organization and institutions that need their services share same infrastructure to run their services. It can be accessed from any location with internet connectivity which is the only requirement. Some of the example include: Google App Engine, IBM Smart Cloud, and Amazon EC2.

2.5.3 Community Cloud Model:

This cloud model allows system and services to be accessible by group of organizations. Third party or member organizations, provider can hold the responsibility of managing the cloud. It shares the infrastructure between differed organizations, several organizations can jointly construct and share the same cloud infrastructure as well as policies, requirements, values and concerns (Dillon and Chang, 2010).

2.5.4 Hybrid Cloud Model:

Is the combination of private and public cloud that has the ability through their interfaces to give room for data, and applications to be moved from one cloud to

another, that is, compatibility and portability across disparate cloud service offering. They use standard methodologies regardless of the institution or location. Hybrid cloud providers can use third party providers in part or full depending on demand, thereby increasing flexibility of computing. Examples are Microsoft Windows Azure, and VMware, vCloud. Romero (2012), described the features of cloud computing and its usefulness in information delivery services and how it can be used in a professional environment. The author found that, cloud computing is a highly scalable platform promising quick access to hardware and software over the internet. Abidi and Abidi, (2012), in their paper stressed that cloud computing would help us in bridging the gap between digital libraries and information technology (IT) by facilitating huge sharing of data among other which in turn can reduce the overall cost incurred by the individual libraries.

The cost reduction and easy maintenance factor in use of cloud computing was also addressed by Bansode and Pujar (2012), Huang and Du (2011), Wang and Xing (2011), in their respective studies addressed the feasibility of setting up cloud based digital libraries, digital library architecture and security issues. Below is the sample diagram of cloud computing technology in academic library.

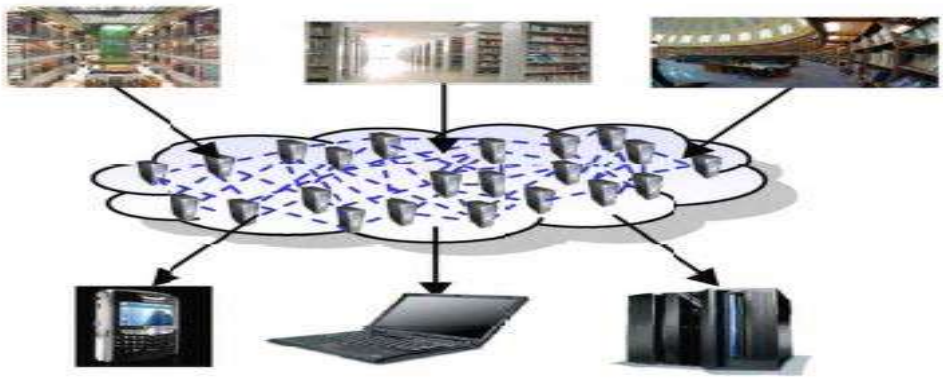


Figure 2.2: Application of Cloud computing in Libraries. From Dastagiri and Kumar (2017)

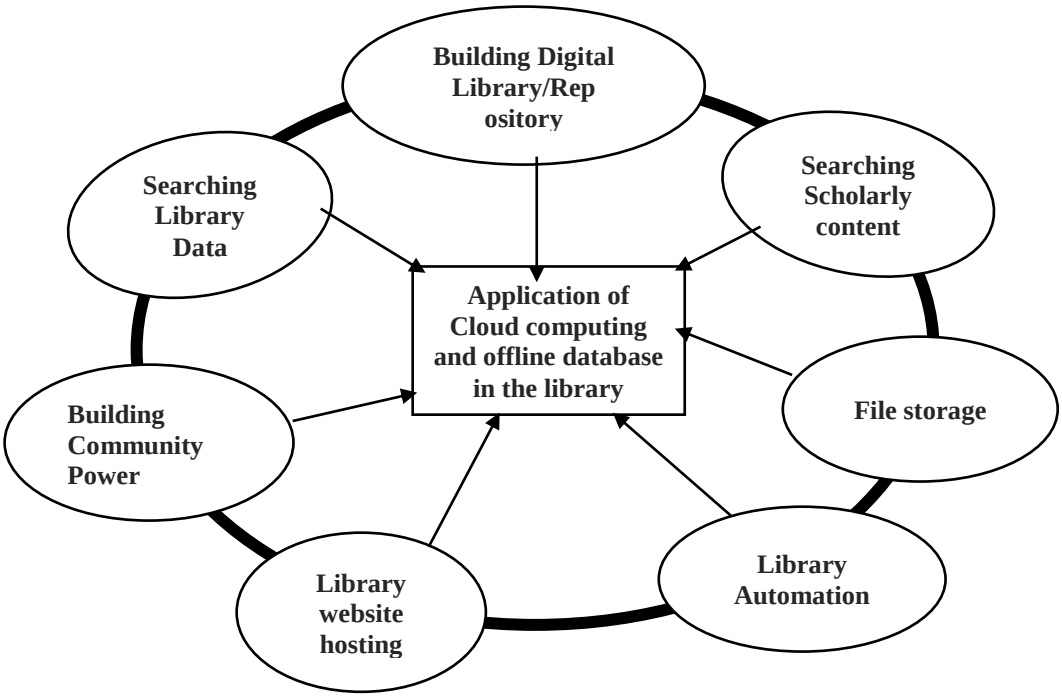


Figure 2.4: Cloud Computing Technology application and Offline Databases in federal university library. From Swapna and Biradar (2017)

2.6 Empirical Review:

Chukwu and Njoku (2018) studied "Information search technologies and academic library databases in a Nigerian university of technology". The research method they adopted was descriptive survey research to investigate a total population of 305 Postgraduate Students of federal university of technology, Owerri. Structured questionnaire was used to collect data for the research out of which 289 were duly filled and returned for analysis. Their Findings revealed low usage of the databases subscribed to by the library. The study also identified some challenges hindering effective usage of the databases in the library. It discovered that lack of awareness of the databases, low speed internet connectivity, insufficient computers with internet connectivity and lack of skills in searching the databases. The similarity of the studies is that, they both focuses on academic library database while the difference between the

two is application of cloud computing technology in relation to effective library service delivery.

Dhanavandan and Tamizhchelvan (2012) conducted a research on "An evaluation of e-resources in academic libraries in Tamil Nadu". The objective of the study was to assess the availability of library e-resources in engineering institutions in Tamil Nadu, the study also adopt survey research design were 200 questionnaires distributed to the various self-financing engineering institution libraries in Tamil Nadu.140 respondents are replied out of 200 libraries. But, rest of the 60 (30%) libraries from the self-financing engineering institutions in Tamil Nadu did not replied. The finding of the study was more number of libraries subscribes to e-journals and e-books and few libraries have online database and CD ROM database collection. Most of the libraries have internet facility in their premises. Majority of the institution libraries have OPAC. Contrastingly they are in the process of developing WEBOPAC, subject gateways and websites. The similarity of the studies is offline database access, while the difference is application of cloud computing technology in the academic library system.

Elgelany and Alghabban (2017) studied "Cloud computing: empirical studies in higher education. A literature review". The finding of the study show that although cloud computing is gaining momentum in Higher Education Libraries, many issues still need to be addressed. Based on the critical, in-depth analysis of collected previous empirical studies, many knowledge gaps are evident. Theses gaps present new limitations and challenges that need further investigation. The following list presents the issues that are the most pressing and are opportunities for further study:

- Most of the existing systems fail to consider reliability, security, privacy and integrity issues. Additionally, some systems have limited access only within the

campus and fail to support access from anywhere, which prevents academics and students the opportunity to access educational materials at their convenience.

- Some existing models allow focusing on teaching and learning; however, these models use costly applications.
- Some existing platforms are flexible, but the complexity of communication among the levels is still an open issue.

The similarity of the both studies is application of cloud computing while the difference is offline database application for effective library service delivery.

Adegbilero and Abiola, (2017) conducted a research on "Library services platform path to cloud computing adoption in Nigerian academic libraries. A review". The objectives of the research was to review the use of cloud computing in academic libraries and how libraries in Nigeria can leverage on the technology through the new library services platform. The paper is based on review done through the search and review of extant literature on the key words of the research topic and the findings show that the although, the uptake of newer technologies like cloud computing is still very low among academic librarians in Nigeria, their attention has been drawn to an important era of modern computing services. The LSP is a certain route to the wider adoption of cloud computing for all categories of libraries across the globe without exempting Nigeria. The similarity of the studies is library services path to cloud computing neglecting offline database for effective service delivery.

Waema and Omwenga (2014) investigate “The adoption state of cloud computing across African continent. The research design adopt for the study was survey research design and the finding show that South Africa, Kenya and Nigeria are the leading countries in the use of cloud computing in Sub-Saharan Africa as of the year 2013.

They further analyzed the report of a survey carried out by Cisco and World Wide Worx (2013) which found that 50% of South Africa's medium and large businesses were using cloud services, compared to 48% in Kenya and 36% in Nigeria. The similarity of the both studies is cloud computing application and survey research design, the deference is that the review did not capture the application of offline database in relation to effective service delivery.

Ibrahim (2014) conducted a research on "Adoption of cloud computing in higher education institutions in Nigeria. The study adopted innovation diffusion theory. Technological, organizational environmental (TOE) and technology acceptance model to explain the adoption of cloud computing in HEIs in Nigeria. Quantitative method was used to collect data by distributing the questionnaire to 200 people from higher education institutions in Nigeria. The finding in this study was used smart (PLS) to analyse the date which seven variable were supported and the three were not support to explain the adoption of cloud computing in higher education in Nigeria. This study encourage the government and management in HEIs to make move on cloud computing to their education by a start from trainability to perceive the benefit on cloud computing. The similarity of the studies is the cloud computing technology while the difference is that the review focuses on adoption cloud computing technology not application of cloud computing and offline database in relation to effective library service delivery.

Comfort (2018) investigated "Issues in the application of cloud computing in academic libraries". The objective of the study view libraries readiness to adopt new technologies such as cloud computing to services as information managers, determine awareness level, concept clarifications, use, and application to library service, cost and staff competence implications for developing countries. The study adopted the survey research design and the finding of the study revealed the need for legislations and

guidelines for a well-established set of standards that can address the cloud computing phenomena before its implementation in the libraries by cloud service provider to be framed. Attached to this study another result showed that cloud service providers need to address the problem of cloud legislations define scope and boundaries of services, also resolve issues of data, loss, privacy, migration and back up. The similarity of the studies is application of cloud computing while the difference is that the literature review focuses on application issues of cloud computing not the benefit and the relation to effective library service delivery.

Enefu (2015) conducted a study on "Adoption of cloud computing technology for library services in the national open university of Nigeria library". The study objective was identifying how NOUN library provides its information services and access to its students who are spread across the nation. Qualitative research method was adopted for the study. The study finding revealed that LAN, WAN, CAN, Internet and Network were the existing computer networks in NOUN library; another finding of the study shows that NOUN library use cloud computing to provide library and information services to its students who are spread across the country where access to information must not be location specific. The major implication faced by the adoption of cloud computing in terms of cost, staff and maintenance were: budgetary issues which lead to inadequate training of staff and recruiting the right staff to do the job. The similarity of the studies is cloud computing for library service neglecting the application of offline database for effective library services.

Neethu and Vanaja, (2017) conducted research on "Concept and applications of cloud computing in libraries". The study adopted survey research design and the finding from the study revealed that libraries are moving towards cloud computing technology in

present time and taking advantages of cloud based services especially in digital libraries, social networking and information communication. Therefore it is time for libraries think seriously for libraries services with cloud based technologies and provide reliable and rapid services to their users. Another role of LIS professionals in this virtual era is to make cloud based services as a reliable medium to disseminate library services to their users with ease of use and save the time of users. Cloud computing is an emerging computing paradigm which promises to provide opportunities for delivering a variety of computing services in a way that has not been experienced before. The finding was also revealed that cloud computing which is applied in digital libraries, analyzes current situation and existing problems of the library .On this basis, on the combination of cloud computing, SaaS, web2.0, SOA and other technologies. All library resources and service distributed on the Internet can be integrated as a whole, which forms a new type of adaptive control service system supporting interlibrary collaboration and service access, as well sharing resources from different libraries. The similarity of the studies is cloud computing application while the difference is the review focuses on only cloud computing services and web technology.

Yuvaraj, (2016) studied "Perception of cloud computing in developing countries A case study of Indian academic libraries". The study adopt descriptive survey research design and the results from the finding indicate that librarians were using cloud computing applications in academic libraries, however, librarians ware also worried about privacy, security and legal jurisdiction in the cloud. Academic libraries work under larger structures with different objectives and missions to support their parent organizations. As an academic library is a unit in an organization (university or institute), initiating cloud-based library services at its own level is a daunting task. Universities can support academic libraries by providing adequate finance to develop cloud-based services, but

there are various issues on which higher authorities and administrators ought to take initiative. Besides the cost, academic libraries ought to think about the quality of cloud services and simply the viability of cloud computing for them. The similarity of studies is cloud computing while the difference is the review focuses on perception of cloud computing or the application of cloud computing in relation to effective service delivery.

Nandkishor (2012) conducted a research on **"**Use of cloud computing in library and information science field". The finding revealed that cloud computing represents an exciting opportunity to bring on-demand applications to digital library, in an environment of reduced risk and enhanced reliability, however, it is important to understand that existing applications cannot just be unleashed on the cloud as is careful attention to design will help ensure a successful deployment. Certainly cloud computing can bring about strategic, transformation and even revolutionary benefits fundamental to digital libraries. For organizations providing digital libraries with significant investment in traditional software and hardware infrastructure, migration to the cloud will bring out considerable technology transition, for less-constrained organizations or those with infrastructure nearing end-of-life, adaptation of cloud computing technology may be more immediate. The similarity of the studies is application of cloud computing while the difference is application of offline database in relation to effective library service delivery.

Nilratan and Sriparna (2013) studied "Cloud computing and its applications in libraries". Objective of the study were on how cloud computing helps in freeing libraries from managing technology so that they can focus on collection building, improved services and innovation. How cloud computing encourages libraries and their users to participate in a network and community of libraries by enabling them to reuse

information and socialize around information. The finding of the study revealed that cloud computing transform the way systems are built and services are delivered, providing libraries with an opportunity to extend their impact, cloud computing has become a major topic of discussion and debate for any organization which relies on technology. The finding also revealed that cloud computing is beneficial as it is flexible, scalable, elastic, pay per usage, economy of scale, cost effective and no maintenance fee for hardware and software, the cloud computing techniques and methods applied to libraries, not only can improve the quality of services and utilization of resources, but also can make more extensive use of cloud computing to our work of life.

Muhammad and Binta, (2017) conducted a research on "Awareness, Access and Use of academic databases by faculty members: A case study of Bayero University library". The object of the study was to determine the level of awareness and use of electronic database by the faculty members. The finding revealed that the use of academic databases recorded some success among the faculty members of Bayero University Kano. The faculty members' level of awareness of the academic databases play vital role in using of these resources. The finding also revealed that accessibility to the online academic databases by the faculty members are interrelated with the use. The similarity of the studies is access and use of academic database while the difference is application of cloud computing in relation to effective library service.

Mahalakshmi and Ally (2012) on "Awareness and application of cloud computing in Indian libraries". The objective of the study was to identify the awareness and applications of cloud computing by Librarians of Engineering Colleges of Coimbatore district Indian and the finding revealed that most of the respondents (98.2%) are aware of the term cloud computing and 87.7% of the respondents are aware of the application of cloud computing in libraries. Half of the respondents (52.6%) are of the opinion that

it is feasible to apply cloud computing in libraries in Indian. The similarity of the studies is cloud computing while the difference is application of offline database in relation to effective library service delivery.

Usman *et al*, (2018) conducted a research on "Provision and utilization of offline information Contents in Nigerian academic libraries for sustainable National Development". The objective of the study was targeted at enhancing the provision and use of offline electronic resources for national development and its sustainability in Nigerian. The finding reveal that the best options to address the poor state of access to research information in Nigerian academic libraries is to rethink and reconfigure our thinking towards provision of offline information contents for rapid national development and its sustainability. In fact, access and use of offline information contents would no doubt meet the yearning and aspiration of the new minds set of academic library customers considering the poor state of internet connectivity in Africa in general and Nigeria in particular. With this therefore, the quality of teaching, learning and research would be strengthen in our tertiary institutions. The similarity of the studies is offline database while the difference is application of cloud computing in relation to effective library service delivery.

2.6.1 Summary of the Review

The study reviewed related literature on cloud computing application and offline databases provision in relation to effective library service delivery, Technology Acceptance Model and Conceptual frame work relationship of variable under study. The review showed that a number of authors reported low application of cloud computing and offline databases provision for effective service delivery in Nigerian university libraries without triangulating the problem through either theory or model to determine the impact of effective service delivery with the application of cloud computing and

offline databases provision in university libraries and also the relationship among the variable before drawing conclusion.

This corroborated with the researchers' statement of problem which shows the gap in the literature that signified the necessity for carrying out this research. The university libraries according to the review are suffering from low application of cloud computing and offline databases provision for effective service delivery compared with, some effort made by the government and the university management in provision and subscription of such resources. A number of authors reported gross dissatisfaction with the provision of cloud computing and offline databases provision due to their inability to access them.

The Technology acceptance model will help in identifying the level of cloud computing and offline databases provision for effective service delivery in university libraries. The conceptual frame work help in drawing the relationship among variables under study. The review of empirical studies has shown that all authors of the previous studies have investigated the concept of either cloud computing application in the library or usage, awareness of electronic databases. There is lack of study that combine application of cloud computing technology and offline databases provision in the library context for effective library service delivery.

In view of the above, it is quite understandable that the previous studies have left wide gaps in the study of application of cloud computing and offline databases provision in relation to effective service delivery in university libraries in Nigeria which necessitate the conduct of the current study to facilitate the identification and the level of determinant or major effective library service delivery with the application of cloud computing technology and offline databases provision in federal university libraries in North West, Nigeria.

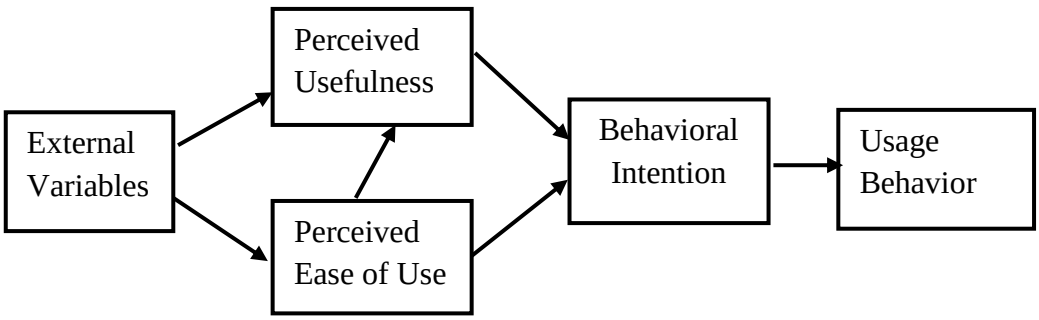
2.7 Theoretical Framework

This study adapted Technology Acceptance Model (TAM) theory which state that an individual's behavioral intention to adopt a system is determined by two beliefs: perceived usefulness and perceived ease of use.

2.7.1 Technology Acceptance Model Theory.

The researcher adopted Technology Acceptance Model propounded by Davis in 1989. "The model explains that an individual's behavioral intention to adopt a system is determined by two beliefs: (1) perceived usefulness, (2) perceived ease of use". Perceived usefulness according to the theorist is the extent to which an individual believes that the usage of a particular system would increase his or her productiveness while the perceived ease of use is described as the degree a person believes that the use of a particular machine would be free of effort. Below is the illustration diagram of Technology Acceptance Model.

Figure 2.4. Technology Acceptance Model (TAM)



Source: Technology Acceptance Model (TAM) Adapted from Lai (2017).

The motive behind the adoption of Technology Acceptance Model (TAM) in this study is connected with prediction of libraries' intention to the application of cloud computing and offline databases provision by evaluating libraries' perceptions of the usefulness of effective service delivery and ease of use of the technology.

The applicability of TAM in measuring the federal university libraries in North West, Nigeria application of cloud computing technology and offline databases provision for effective library service delivery as well as the perception of using the technology can be summed up as follows:

i. When the federal university libraries perceive the cloud computing applications and offline databases provision to be useful and easy to use, then they may have a positive attitude towards it application and use for effective library service delivery.

ii. Whilst federal university libraries understand the cloud computing applications and offline databases provision as simple to apply and use, then they will have an effective mindset closer to take the advantage of the system for effective library service delivery.

iii. When librarians in federal university libraries in North West Nigeria have a positive attitude towards the cloud computing applications and offline databases, then they may use them frequently and intensively and develop favorable intentions towards using the cloud computing and offline databases for effective library service delivery.

iv. When librarians continue to use the technology that means there are benefits attached to the system for effective library service delivery.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

Introduction

This chapter describes the methodology undertaken by the researcher in realizing the application and provision tagged in the federal university libraries for effective service delivery "cloud computing technology and offline database". In other words, this chapter analyses the procedure taken by the researcher in analysing the research data.

3.1 Research Design

Descriptive survey research, was used for this studied in investigating the level of cloud computing application and offline databases provision in relation to effective service delivery in Federal University Library in North West, Nigeria. By giving a clearer understanding of the variables, in line with the choice of this research design. Abdulrahman (2018) described, descriptive studies as studies designed to identify and describe the characteristics of the subject of study or unit of analysis.

The descriptive survey is adopted because it is considered important and most relevant to the study as it permit the use of questionnaire and observation checklist. The descriptive survey enable the researcher to use questionnaire to acquire accurate data by the allowing the respondent freedom of expression so as to achieve the aims of the study it help to keep the respondent mind fixed to the subject in which will help the research to discover the respondent perception and investigate fact about the level of cloud computing technology application and offline databases provision in relation to effective service delivery in North West, Nigeria under study.

This study used direct observation of the demonstrable skills on focus group that is e-librarians and library ICT staffs in federal university libraries in North West, Nigeria. Focus group is found suitable to observe the efficiency and effective library service

delivery, with the application of cloud computing technology and offline databases provision.

3.2 Population of Study

The population of this study was made up of 214 e-librarians and ICT library staffs from Nine (9) federal university libraries in North West, Nigeria. For the Table 3.1 see appendix B.

3.3 Sample and Sampling Technique

The sample size for this studied is 177 e-librarians and library ICT staff. This study applied purposive sampling techniques to select federal university libraries with element of cloud computing application and offline databases provision in them from the Nine (9) federal university libraries in North West, Nigeria. The federal university libraries selected to represent the entire federal university libraries in North West Nigeria, Namely: Kashim Ibrahim library Ahamadu Bello University Zaria, Abdullahi Fodiyo Library Usmanu Danfodiyo University Sokoto and Bayero University Library Kano, Kano State respectively, because they have element of cloud computing and offline databases in them. Table 3.2 shows the detailed information about the sample selected for the study using, total enumeration considering the population of the selected three federal university libraries, 177 e-librarians and ICT library staffs in three federal university in North West, Nigeria below is the table for the sample size of the study.

Table 3.2: Sample Size of the Study

S/No	*Name of Library/ Institution*	*No. of e-librarians and library ICT staffs*	*Sample Size*
1	Kashim Ibrahim library (ABU) Zaria,	150	150
2	Bayaro university library (BUK) Kano	15	15
3	Abdullahi Fodiyo Library (UDU), Sokoto	12	12
	Total	177	177

3.4 Research Instruments

The instrument used for data collection are structured questionnaire and observation checklist. The questionnaire is designed for both e-Librarians and library ICT staffs in federal university libraries in North West, Nigeria while the observation checklist was used to find out the available ICT facilities and services in the libraries. The questionnaire have three separate sections; with section A designed to capture the respondent demographic information of all the institutions with separate demographic information style with introduction letter to respondent, while the last section which is section B and C, will capture the research questions. Thus:

1. Effective Library Service Assessment with cloud computing application and offline databases provision Questionnaire **(ACCAODPQ)**.

3.5 Validity of Instruments

The face of the instruments for this study are validated by my supervisor, two lecturers in the department of library and information technology and an expert in cloud computing application and offline databases provision in the library, be for administering to the respondent. The lectures vetted the instrument by careful examination of the instrument and made necessary corrections. The researcher effected

the corrections on the instrument before it was used to carry out the pilot study and the data collection.

3.6 Reliability of the Instruments

The instruments are used to conduct the pilot stud, administered to the respondents in Aliero Kebbi State University of Science and Technology library, e-librarian and library ICT staff to examine the level of reliability. The rationale behind the selection of the university library is because is an academic library and have the mandate to produce high quality manpower, and in addition is not part of the study population for efficiency and accurate of respondent judgment. The data collected from the pilot test ware tested using Cronbach Alpha to ascertain the reliability of the questionnaire at 95% Level of Confidence and 5% Confidence interval.

The result revealed that the instrument yielded 0.844 reliability Coefficient on the Cronbach Alpha scale. This was an indication that the instrument is reliable for the study.

3.7 Methods of Data Collection

The researcher collected an introduction letter from the head of the department of library and information technology and embarked on field work to three (3) selected federal university libraries in North West Nigeria. The researcher first visited Ahmadu Bello University library Zaria and he equally visited Bayero University Library Kano and that of Usman Danfodiyo University Sokoto. During the visit, the researcher sought the services of two research assistants, in the university library to help in administering and collection of research instruments for data collection to the targeted population under study (e-librarians and library ICT staffs in the libraries). This was to aid the effectiveness and efficiency of the study. The research instrument ware explain to the research assistants on how to administer and collection of the questionnaires

from the respondent. This was important so as to eliminate the possibility of misinterpreting the research question on the part of the respondents. The researcher also went round the university libraries to observe the types of ICT facilities/electronic resources and services available in the university library on the study using the observation checklist. The copies of the questionnaire are collected at a reasonable time line after they were filled by the respondents. The researcher departed with the copies of questionnaire collected in order to make data analysis and interpret the result.

3.8 Method of Data Analysis

The data collected from the research was organised and analysed based on the research questions and hypotheses formulated. Descriptive statistical analysis was used, Percentages were generated and tables were drawn where necessary. RQl, to RQ4 was analysed using percentage while RQ5 to RQ6 was analysed using mean and standard deviation and any mean up to or above the cut-off point of 1.5 was regarded as agreed and strongly agreed. While any item with the mean below the cut-off point of 1.5 was regarded as disagreed and strongly disagreed. 4 scale liker scale rating number was used to weight the responses for the purposes of analysis in SPSS and the hypotheses was analysed using correlation Analyses at $P< 0.05$ level of significance.

The ranking scale attached to each checklist on ICT facilities and services is as follow:

Available = 1. Not Available = 0

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Response Rate

A total of one hundred and seventy seven (177) copies of questionnaire are distributed to the respondents in three selected University libraries in North-West Nigeria. Out of which, one hundred and thirteen (113) copies of questionnaire, representing 63.8% were properly filled and found usable for analysis. Twenty-three (64) representing 36.2% were not returned. Hence the response rate is 63.8%. See the table 4.1 in appendix B

4.2 Presentation of result on research question and hypotheses

Research question 1: What are the available ICT infrastructure/facilities in your library?

Table 4.5 Checklist on Available ICT Infrastructure/Facilities in the Library

ITEMS	*INSTITUTION*	*AVAILABLE*	*NOT AVAILABLE*	*PERCENTAGE*
Computer Systems	ABU. LIBRARY	1		100% Available
	BUK. LIBRARY	1		
	UDUS. LIBRARY	1		
Systems server	ABU. LIBRARY	1		100% Available
	BUK. LIBRARY	1		
	UDUS. LIBRARY	1		
Scanner	ABU. LIBRARY	1		100% Available
	BUK. LIBRARY	1		
	UDUS. LIBRARY	1		
Intranet/UPS	ABU. LIBRARY	1		100% Available
	BUK. LIBRARY	1		
	UDUS. LIBRARY	1		
Internet connectivity	ABU. LIBRARY	1		100% Available
	BUK. LIBRARY	1		
	UDUS. LIBRARY	1		
Speedy local area network (LAN) /Wide area network (WAN)	ABU. LIBRARY	1		100% Available
	BUK. LIBRARY	1		
	UDUS. LIBRARY	1		
Printer	ABU. LIBRARY	1		100% Available
	BUK. LIBRARY	1		
	UDUS. LIBRARY	1		
Photocopier	ABU. LIBRARY	1		100% Available
	BUK. LIBRARY	1		
	UDUS. LIBRARY	1		
Back code Scanner	ABU. LIBRARY	1		100% Available
	BUK. LIBRARY	1		
	UDUS. LIBRARY	1		
	ABU. LIBRARY	1		

			100% Available
Text editors/ OCR	BUK. LIBRARY	1	
	UDUS. LIBRARY	1	

Available 1, Not Available 0

From table 4.5, the observation checklist used by the researcher revealed that all the 10 ICTs infrastructure/facilities listed were available in selected university libraries in North West Nigeria under studied

Research Question 2: What are the cloud computing technology application service used for effective service delivery in federal university libraries in North West, Nigeria?

Table 4.6 *Service provided using cloud computing technology for effective service delivery*

ITEMS	*INSTITUTION*	*AVAILABLE*	*NOT AVAILABLE*	*Percentage*
Dspace Service	ABU. LIBRARY	1		100% Available
	BUK. LIBRARY	1		
	UDUS. LIBRARY	1		
Green Stone service	ABU. LIBRARY		0	100% Not Available
	BUK. LIBRARY		0	
	UDUS. LIBRARY		0	
ExLibris Service	ABU. LIBRARY		0	100% Not Available
	BUK. LIBRARY		0	
	UDUS. LIBRARY		0	
OCLC Service	ABU. LIBRARY	1		100% Available
	BUK. LIBRARY	1		
	UDUS. LIBRARY	1		
LibLine Service	ABU. LIBRARY		0	100% Not Available
	BUK. LIBRARY		0	
	UDUS. LIBRARY		0	
Google Drive Service	ABU. LIBRARY	1		100% Available
	BUK. LIBRARY	1		
	UDUS. LIBRARY	1		
One Drive Service	ABU LIBRARY	1		100% Available
	BUK. LIBRARY	1		

	UDUS LIBRARY	**1**		
	ABU. LIBRARY		**0**	**66.7% Available with 33.3% Not available**
	BUK. LIBRARY		**0**	
icloud Service				
	UDUS. LIBRARY	**1**		

Available 1, Not Available 0

From the table 4.6 the percentage used by the researcher revealed that only four (4) services provided using cloud computing technology such as Dspace service, google drive service, OCL Service, One Drive Service and icloud Service were available having 54.17% of the total items, while Green Stone service, ExLibris Service, LibLine Service and icloud service were not available having 45.83% of the total items in three selected federal university libraries in North West Nigeria under study.

Research Question 3: What type of offline databases are provided by the federal university libraries for effective service delivery in North West, Nigeria?

Table 4.7 *Offline databases provided by the federal university libraries for effective service delivery*

ITEMS	*INSTITUTION*	*AVAILABLE*	*NOT AVAILABLE*	*Percentage*
	ABU. LIBRARY	**1**		**100%**
CD-ROMs	**BUK. LIBRARY**	**1**		**Available**
	UDUS. LIBRARY	**1**		
	ABU. LIBRARY	**1**		**100%**
E- granary	**BUK. LIBRARY**	**1**		**Available**
	UDUS. LIBRARY	**1**		
	ABU. LIBRARY	**1**		**100%**
TEEAL	**BUK. LIBRARY**	**1**		**Available**
	UDUS. LIBRARY	**1**		
	ABU. LIBRARY	**1**		**66.7% Available with**
	BUK. LIBRARY		**0**	
OPAC	**UDUS. LIBRARY**	**1**		
	ABU. LIBRARY		**0**	**100% Not available**
Green Stone	**BUK. LIBRARY**		**0**	
	UDUS. LIBRARY		**0**	
	ABU. LIBRARY	**1**		**100% Available**
External/Internal Hard Disc	**BUK. LIBRARY**	**1**		
	UDUS. LIBRARY	**1**		
	ABU LIBRARY	**1**		**100% Available**
Computer Server	**BUK. LIBRARY**	**1**		
	UDUS LIBRARY	**1**		
	ABU. LIBRARY	**1**		**100% Available**
DVDs	**BUK. LIBRARY**	**1**		
	UDUS. LIBRARY	**1**		
CDs	**ABU. LIBRARY**	**1**		**100% Available**
	BUK.LIBRARY	**1**		
	UDUS. LIBRARY	**1**		

	ABU. LIBRARY	**1**		**66.7% not available**
Zip Drive	**BUK. LIBRARY**		**0**	
	UDUS. LIBRARY		**0**	

Available 1, Not Available 0

From the table 4.7 the percentage used by the researcher revealed that Nine (9) out of ten (10) items listed were available in selected university libraries in North West Nigeria under study having 80% of the total items listed, while 20% were not available.

Research Question 4: What are the type of electronic information resources found on cloud computing technology and offline databases used by the federal university libraries in North West, Nigeria?

Table 4.8 *Electronic information resources found on cloud computing technology and offline databases used by the federal university libraries.*

ITEMS	*INSTITUTION*	*AVAILABLE*	*NOT AVAILABLE*	*Percentage*
	ABU. LIBRARY	**1**		**100% Available**
E- Books	**BUK. LIBRARY**	**1**		
	UDUS. LIBRARY	**1**		
	ABU. LIBRARY	**1**		**100% Available**
E- journal	**BUK. LIBRARY**	**1**		
	UDUS. LIBRARY	**1**		
	ABU. LIBRARY	**1**		**100% Available**
E- theses	**BUK. LIBRARY**	**1**		
	UDUS. LIBRARY	**1**		
	ABU. LIBRARY	**1**		**100% Available**
E- conference papers	**BUK. LIBRARY**	**1**		
	UDUS. LIBRARY	**1**		
	ABU. LIBRARY	**1**		**100% Available**
E- articles	**BUK. LIBRARY**	**1**		
	UDUS. LIBRARY	**1**		
	ABU. LIBRARY		**0**	**100% Not available**
E- Lecture note	**BUK. LIBRARY**		**0**	
	UDUS. LIBRARY		**0**	
	ABU. LIBRARY		**0**	**100% Not available**
E-seminar presentation	**BUK. LIBRARY**		**0**	
	UDUS. LIBRARY		**0**	

Available 1, Not Available 0

Table 4.8, the percentage used by the researcher revealed that only five (5) out of seven (7) electronics resources were found on cloud computing technology and offline database, having 71.5% of the items listed, while 28.5% of the two items were not available the in selected university libraries in North West Nigeria under study.

Research Question 5: What are the factors affecting cloud computing application for effective service delivery in federal university libraries in North West, Nigeria?

Table 4.9: *Factors affecting cloud computing application for effective service delivery in federal university libraries.*

ITEMS	*ABU Library 89*	*BUK. Library13*	*UDUS. Library 11*	*Overall Mean*	*Std. Deviation*	*Dec*
	$\overline{X}_1$	$\overline{X}_2$	$\overline{X}_3$	$\overline{X}$		
Inadequate funding of library electronic services	1.966	2.385	2.455	2.269	1.076	D
Poor Internet connection.	1.326	2.385	2.364	2.025	0.832	D
Lack of technical staff to assist the users.	1.551	2.462	2.546	2.186	1.605	D
Techno-stress.	1.191	1.000	2.000	1.397	1.042	S
Slow download speed.	1.764	2.539	2.182	2.161	0.786	D
Anxiety (Technophobia).	1.764	1.769	2.000	1.844	0.958	D
Inadequate users' information literacy training.	1.764	2.231	2.364	2.119	1.076	D
Insufficient number of cooling systems.	1.764	1.692	1.818	1.758	0.932	D
Lack of online registration facilities.	1.764	2.385	2.909	2.352	0.591	D
Epileptic power supply	1.764	1.769	2.363	1.966	0.945	D
Lack of power backup systems.	1.764	2.769	2.000	2.178	0.833	D
Lack of dedicated server in the library.	1.764	1.615	1.455	1.611	0.987	D
Lack of awareness.	1.764	1.769	2.273	1.935	0.719	D
Inadequate security measures.	1.764	1.615	2.273	1.884	1.021	D
Inadequate computer to access the resources.	1.764	2.385	2.546	2.231	0.665	D
Inadequate bandwidth to sustain internet services.	1.764	1.385	1.364	1.504	1.149	D
Attitude of some library staff	1.764	0.769	0.909	1.147	0.945	S
Information overload	1.764	0.769	0.909	1.147	0.945	S

$\underline{X} \geq 1.5$ = Agree. Represented by (D) $\underline{X} < 1.5$ = Disagree. Represented by (S)

The table 4.9 show that factors such as inadequate bandwidth to sustain internet services, lack of technical staff to assist the users, Inadequate funding of library electronic services, inadequate users' information literacy training, Inadequate security measures, lack of dedicated server in the library, anxiety (Technophobia), epileptic power supply, insufficient number of cooling systems, lack of power backup systems, poor Internet connection, Slow download speed, lack of awareness, Inadequate computer to access the resources, lack of online registration facilities, met the decision mean of 1.5 as such respondent of the selected University libraries under study indicate them to be the factors militating against cloud computing application for effective service delivery in federal university libraries. While the respondent from federal university libraries BUK and ABU under study revealed that, techno stress, attitude of some library staff, Information overload are not the factors affecting cloud computing application. This is due to the fact that their mean score is not up to the decision mean of 1.5. However the respondent from federal university Zaria agree with factors, techno-stress, attitude of some library staff and information overload as their mean score is above the decision mean of 1.5. While the respondent from BUK and UDUS disagree with the factors as their mean score is not up to the decision mean of 1.5

Research Question 6: What are the challenges facing offline databases provision for effective service delivery in federal university libraries in North West, Nigeria?

Table 4.10: *Challenges facing offline databases provision for effective service delivery in federal university libraries.*

ITEMS	***ABU. Library 89***	***BUK. Library 13***	***UDUS. Library 11***	***Overall Mean***	***STD. Deviation***	***DEC***
	$\boldsymbol{X}_1$	$\overline{\boldsymbol{X}}_2$	$\overline{\boldsymbol{X}}_3$	$\overline{\boldsymbol{X}}$		
Inadequate funding of library electronic resources	2.636	2.636	2.326	2.532	0.642	D
Poor Intranet connection.	1.455	1.455	1.449	1.453	1.079	S
Lack of technical staff to assist the users.	1.455	1.455	1.449	1.453	1.320	S
Limited number of available book titles.	2.091	2.091	1.124	1.769	1.137	D
Limited number of available e-journal titles.	2.00	2.00	1.539	1.846	0.992	D
Techno-stress.	1.273	1.273	1.326	1.290	1.040	S
Anxiety (Technophobia).	2.364	2.364	0.910	1.879	1.162	D
Insufficient number of cooling systems.	2.909	2.909	2.371	2.729	0.479	D
Epileptic power supply	2.364	2.364	2.056	2.261	0.828	D
Lack of power backup systems.	2.000	2.000	1.551	1.8502	1.007	D
Lack of dedicated server in the library.	1.455	1.455	1.685	1.531	0.951	A
Lack of awareness.	1.273	1.546	1.449	1.332	0.804	S
Inadequate security measures.	1.546	0.909	1.326	1.472	1.211	S
Attitude of some library staff	0.909	1.546	1.461	1.093	0.953	S
Information overload	1.245	1.346	1.146	1.246	1.036	S

$\overline{\boldsymbol{X}} \geq 1.5$ = Agree. Represented by (D) $\overline{\boldsymbol{X}} < 1.5$ = Disagree. Represented by (S

The table 4.10 revealed the challenges such as limited number of available e-book titles, anxiety (Technophobia), lack of power backup, limited number of available e-journal titles, lack of dedicated server in the library, epileptic power supply, inadequate funding of library electronic resources, Insufficient number of cooling systems as factors

militating offline database used by the library, met the decision mean of 1.5 as such respondent of the selected university libraries under study indicate them to be the factors militating against offline database use for effective library service delivery. However the respondent in the federal university under study reveal that lack of technical staff to assist the users, inadequate security measures, poor Intranet connection, information overload, techno-stress, attitude of some library staff, lack of awareness, are not factors affecting provision of offline database for effective library service delivery. This is due to the fact that their mean score is not up to the decision mean of 1.5

4.3 Hypotheses Testing

H_{O1}: There is no significant relationship between cloud computing technology application service and effective library service delivery in federal university libraries in North West, Nigeria.

Table 4.11: *Summary of the correlation analysis on the significant relationship between the cloud computing technology application service and effective library service delivery in federal university libraries in North West, Nigeria.*

Group	*Pearson correlation*	*p-value (Sig.)*
ABU. Library	0.86	0.001
BUK. Library	0.813	0.003
UDUS. Library	0.811	0.001

Significance at $p<0.05$ (1-tailed)

Table 4.11, Shows that the correlation coefficient between cloud computing technology application and effective library service delivery of ABU Zaria equal 0.867 and the p-value (Sig.) equal 0.001. The p-value (Sig.) is less than 0.05, so the correlation coefficient is statistically significant at $\alpha = 0.05$. The researcher concludes that there is a

significant relationship between cloud computing technology application and effective library service delivery. The table also shows that the correlation coefficient between cloud computing technology and effective service delivery of BUK Library equals 0.813 and the P-value is (Sig) equal 0.003. The P-value is (Sig.) at $p<0.05$. The researcher conclude that there is a significant relationship between cloud computing technology application and effective library service delivery in BUK. The UDUS data shows that the correlation coefficient between cloud computing technology and effective service delivery equals 0.811 and the p-value (Sig.) equals 0.001. The p-value (Sig.) is less than 0.05, so the correlation coefficient is statistically significant at $p<0.05$. The researcher concludes that there is a significant relationship between cloud computing technology application and effective library service delivery in federal university libraries in North West Nigeria.

H_{O2}: There is no significant relationship between the offline database provided and effective library service delivery in federal university libraries in North West, Nigeria.

Table 4.12: *Summary of the correlation analysis on the significant relationship between offline database provided and effective library service delivery in federal university libraries in North West, Nigeria.*

Group	*Pearson correlation*	*p-value (Sig.)*
ABU. Library	0.764	0.001
BUK. Library	0.718	0.002
UDUS. Library	0.715	0.001

Significance at $p<0.05$ (1-tailed)

Table 4.12, shows that the correlation coefficient between cloud computing technology application and effective library service delivery of ABU Zaria equal 0.764 and the p-

value (Sig.) equal 0.001. The p-value (Sig.) is less than 0.05, so the correlation coefficient is statistically significant at $\alpha = 0.05$. The researcher concludes that there is a significant relationship between cloud computing technology application and effective library service delivery. The table also shows that the correlation coefficient between cloud computing technology and effective service delivery of BUK Library equals 0.718 and the P-value is (Sig) equal 0.002. The P-value is (Sig.) at $p<0.05$. The researcher conclude that there is a significant relationship between cloud computing technology application and effective library service delivery in BUK. The UDUS data shows that the correlation coefficient between cloud computing technology and effective service delivery equals 0.715 and the p-value (Sig.) equals 0.001. The p-value (Sig.) is less than 0.05, so the correlation coefficient is statistically significant at $p<0.05$. The researcher concludes that there is a significant relationship between cloud computing technology application and effective library service delivery in federal university libraries in North West Nigeria.

$H_{O3:}$ There is no significant influence on effective library service delivery in federal university library in North West, Nigeria.

Table 4.13*: Summary of correlation analysis on the significant influence on effective service delivery in federal university libraries in North West, Nigeria.*

Group	*Pearson correlation*	*p-value (Sig.)*
ABU. Library	0.842	0.001
BUK. Library	0.789	0.003
UDUS. Library	0.787	0.001

Significance at $p<0.05$ (1-tailed)

Table 4.13 reveals that the correlation coefficient between effective service delivery and Ahmadu Bello University Zaria equal 0.842 and the p-value (Sig.) equal 0.001. The p-

value (Sig.) is less than 0.05, so the correlation coefficient is statistically significant at α = 0.05 and thus the null hypothesis is rejected. The researcher conclude that there is a significant relationship between effective library service delivery and ABU Library. The table also reveal that the correlation coefficient between effective service delivery and Bayero University Kano Library equals 0.789 and the P-value is (Sig) equal 0.003. The P-value is (Sig.) at $p<0.05$. The researcher concludes that there is a significant relationship between effective service delivery and BUK library. The Usman Dafodiyo University Sokoto shows that the correlation coefficient between effective service delivery and the university library equals 0.787 and the p-value (Sig.) equals 0.001. The p-value (Sig.) is less than 0.05, so the correlation coefficient is statistically significant at $\alpha=0.05$ for the null hypothesis which is rejected. The researcher conclude that there is a significant relationship between effective service delivery and the federal university libraries in North West Nigeria.

H_{O4}: There is no significant difference between application of cloud computing and offline databases provision on effective library service delivery in federal university libraries in North West Nigeria.

Table 4.14: *Summary of correlation analysis on the significant difference between application of cloud computing and offline databases provision for effective service delivery in federal university libraries in North West Nigeria.*

Group	*Pearson correlation*	*p-value (Sig.)*
ABU. Library	0.816	0.001
BUK. Library	0.766	0.002
UDUS. Library	0.763	0.001

Significance at $p<0.05$ (1-tailed)

Table 4.14, Shows that the correlation coefficient between cloud computing technology application and offline database on effective library service delivery of ABU Zaria equal 0.816 and the p-value (Sig.) equal 0.001. The p-value (Sig.) is less than 0.05, so the correlation coefficient is statistically significant at $\alpha = 0.05$ so the null hypothesis is rejected. The researcher concludes that there is a significant relationship between cloud computing technology application and offline database on effective library service delivery. The table also show that the correlation coefficient between cloud computing technology and offline database on effective service delivery of BUK Library equals 0.766 and the P-value is (Sig) equal 0.002. The P-value is (Sig.) at $p<0.05$. The researcher concludes that there is a significant relationship between cloud computing technology application and offline database on effective library service delivery in BUK. The UDUS data shows that the correlation coefficient between cloud computing technology application and offline database on effective service delivery equals 0.763 and the p-value (Sig.) equals n0.001. The p-value (Sig.) is less than 0.05, so the correlation coefficient is statistically significant at $p<0.05$. The researcher concludes that there is a significant relationship between cloud computing technology application and offline database on effective library service delivery in federal university libraries in North West Nigeria.

4.4 Summary of Major Findings

The major findings of the study are as follows:

1. The study revealed that the three institution libraries studied have equal available ICT infrastructure and facilities.
2. The study revealed that despite the availability of ICT's type of service facilities only four cloud computing service are available in the three university libraries

studied, while UDUS have five among the eight items listed for effective library service delivery.

3. The study also revealed that eight among ten of the offline databases outline by the researcher are available in all the three university libraries studied, while OPAC is only available in ABU and UDUS university libraries while Green stone was not found in any of the three university libraries studied.
4. The study revealed that the seven electronic information resources listed by the researcher are found on cloud computing and offline database in federal university libraries studied.
5. The study revealed that out of nineteen, sixteen factors affecting cloud computing technology application outline by the researcher are agreed by the respondents.
6. The study also reveal that nine factors outline by the research affect offline database provision in the library for effective service delivery agreed by the respondents.
7. Hypothesis one tested revealed significant relationship between cloud computing technology, and effective library service delivery.
8. Hypothesis two tested show significant relationship between offline database provided and effective library service delivery.
9. Hypothesis three tested revealed that there is significant influence of effective service deliver in the university library
10. Hypothesis four tested show significant difference between cloud computing technology application and offline database in relation to effective service delivery.

4.5 Discussion

4.5.1 Demographic information of the respondents

The study reveal that, most of the e-librarian and library ICT staff in three selected federal university libraries studied were holders of master's degree, with years' of working experience predominant between 6-10 respectively. This study is in line with the finding of Buyya (2012), the author reported that "there is a significant relationship between educational level and technology acceptance.

4.5.2 Availability of ICT infrastructure/facilities in selected federal university libraries

The study found that all the items listed in the checklist were available in the three university libraries studied. The availability of ICT facilities can be attributed to the fact that the university libraries have attached a greater value to the provision of electronic facilities and services which has made them ready to be use. This is in line with the study of Lefuma (2017) which states that availability of the ICTs facilities is a key pre-condition towards learning and benefiting from e-resources in the library.

4.5.3 Services provided using cloud computing technology for effective service delivery in selected university libraries.

The study show that services provided using cloud computing technology such as Dspace service, google drive service, OCL Service, One Drive Service and icloud Service were available in the selected university libraries studied, while Green Stone service, ExLibris Service, LibLine Service and icloud service were not available in ABU and BUK libraries, while icloud was found available in UDUS library. This is an indication that the three selected federal university libraries in North West Nigeria studied are now moving to cloud for effective library services. This is line with the

finding of Kaushik and Kumar, (2013), which state that no doubt, libraries are moving towards cloud computing technology in present time and taking advantages of cloud based services especially in building digital libraries, social networking and information communication with manifold flexibilities. Dillip (2014), added that in regard to the complex nature of data management, handling, and administration, cloud computing is recently considered as the most striking model for supporting the libraries in effective service provision, long term preservation and perpetual access of library data.

4.5.4 Offline databases used by the university libraries for effective service delivery in selected federal university libraries.

The study found that nine (9) out of ten (10) offline electronic databases listed by the researcher such as CD-ROMs, OPAC, E-granary, TEEAL, External/Internal hard disc, Computer server, DVDs, Flash drive, ZIP drive were available in the university libraries in North West Nigeria studied, however OPAC is not found in BUK library while Green stone was not found in any of the selected university libraries. This is in line with the finding of Usman *et al.,* (2018) which stated that the provision and use of offline information contents would no doubt meet the yearning and aspiration of the new minds set of academic library customers considering the poor stage of internet connectivity in Africa in general and Nigeria in particular.

4.5.5 Electronic information resources found on cloud computing technology and offline databases used by the university libraries.

The study found that seven (7) electronics information resources outlined by the researcher were found on cloud computing technology and offline databases the in the federal university libraries in North West Nigeria studied. However lecture note and e-seminar presentation were not available on cloud computing and offline databases in

selected university libraries. This is in line with finding of Nagalakshmi (2013) who reiterated that as information were exploded in recent age and the usages are been increased, cloud computing became a platform to store the information in one place that is, in a common server and distribute the same to all the users whenever required via web based systems similarly Johnson *et al.,* (2012) noted that e-resources are those materials that require computer access, whether through personal computer, mainframe, or handheld mobile devices.

4.5.6 Factors affecting cloud computing application for effective library service delivery in university libraries.

Despite the fact that the three university libraries shown some availability of cloud computing services. They still consider inadequate bandwidth to sustain internet services, lack of technical staff to assist the users, Inadequate funding of library electronic services, inadequate users' information literacy training, Inadequate security measures, lack of dedicated server in the library, anxiety (Technophobia), epileptic power supply, insufficient number of cooling systems, lack of power backup systems, poor Internet connection, Slow download speed, lack of awareness, Inadequate computer to access the resources, lack of online registration facilities as major factors affecting cloud computing application their library. This show that despite these services were available the university library have long way to go in cloud computing application for effective library services. This is in line with finding of Kuliya *et al*., (2015) where he also view poor quality or unavailability of internet service can hinder prompt availability of data, Fear of hackers, lack of technical skills in the deployment of cloud computing service, lack of flexibility of the policy or legal framework for cloud computing and the need for current ICT infrastructures and social amenities needed to

establish cloud computing data centers across the country as the factors affecting cloud computing application in Nigeria.

4.5.7 Challenges facing offline databases provision for effective service delivery in federal university libraries.

The study revealed that the three university libraries have acquire most of the offline database outline by the researcher, still they have shown: Limited number of available e-book titles, anxiety (Technophobia), lack of power backup, limited number of available e-journal titles, lack of dedicated server in the library, epileptic power supply, inadequate funding of library electronic resources, Insufficient number of cooling systems as factors militating offline database used by the library. This is in line with the study of Usman *et al.,* (2018) that view poor state of ICTs facilities, shrinking nature of library budget, licensing of information resources, insufficient number of electronics resources, technophobia and lack of effective information searching and information retrieval skills as factor militating against effective use of offline databases in the library.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The study concluded that despite the availability of some cloud computing services and offline database provided in the three selected federal university libraries in North-west Nigeria, the level of cloud computing application is lower than that of offline databases provided which shows that the offline database gadget are more provided by the federal university libraries studied than cloud computing application as shown in table 4.7 and 4.8, which consequentially affected the attainment of high level of cloud computing application.

However in the correlation analysis, the cloud computing application have more significant relationship to effective library service delivery for the three selected university libraries with a correlation number of 0.830, while offline database have correlation number of 0.732. Also from the study correlation analysis it revealed that there is urgent need for the library management, especially university management to provide cloud computing services for their libraries and also take proactive majors to address the factors affecting cloud computing application and offline database provision for effective library service delivery.

5.2 Recommendations

Based on the findings of this study, the following recommendations are made:

i. Management of university libraries should understand that the cloud computing and offline database availability does not mean they are functional, hence they should make remarkable and implementable policies that will encourage both staff and e- library users training and ensure that they are accessible

ii. Management of university in Northern Nigeria should ensure that the cloud computing services and offline databases provided does means they are maximally utilised, hence they should employ library staff that are ICT inclined who also are professionals on e-library services to always offer needed assistance for effective library services delivery.

iii. Government should understand the global value placed on cloud computing services and offline databases in academic libraries, therefore they should provide the needed fund to sustain and enhance the application and provision of such facilities and services for effective service delivery in university libraries in Nigeria.

iv. The cloud computing service providers should make the cloud computing be applicable without prejudice by libraries and users, the security concerns of users should be rectified first to make cloud environment trustworthy. The trustworthy environment is the basic prerequisite to win confidence of libraries to continue to use the technology. For application of any cloud computing solutions in libraries, there is a need for well-defined regulations as well as transparent policies. The study can be used as a guideline by the libraries that are planning to apply cloud computing based solution in the future.

v. University librarians should ensure that adequate and relevant electronic resources are on offline database provided and also meet the copyright policies to remove fear by the side of users, in order to attain effective library service delivery.

vi. Poor electricity supply has been a major challenge to almost all academic library activities in Nigeria. Therefore library managers, directors and the university management in Northern Nigeria should consider it as a priority to acquire standby generator among other sources of electricity so as to ensure that electricity supply to libraries is not broken.

vii. The internet has been a veritable tool and considered indispensable by libraries in this modern world. Therefore the government and the university management must understand the value attached to electronic library services, hence substantial fund should be released by government and the university management to fund library internet services, noting that such services are quite expensive to procure and maintain.

viii. University management and the library managers in Northern Nigeria must ensure that internet service is not only accessible in the library premises but made available and accessible everywhere in the university campus. This is to allow users have 24 hours access to electronic information resources and services for effective service delivery.

5.3 Contribution to Knowledge

This study hope to contribute to knowledge in the following ways:

1. The study provided knowledge on the cloud computing application and offline database provision, types of electronic resources and services library require in the academic library to attain effective library service delivery in Nigeria.
2. The study hope to inform all stakeholders on how to address the issues of cloud computing application and offline databases provision in academic libraries and the challenges confronting them.
3. The study has shown different level of cloud computing application and offline database provision of the three university libraries.

5.4 Suggestions for Further Studies

1. A level of application of cloud computing and offline databases among academic libraries in selected universities in North-West Nigeria.
2. Assessment of cloud services and offline databases for effective library service delivery in universities in North-East Nigeria.

3. Influence of cloud computing technology and offline databases provision on user's satisfaction in selected university libraries in South-South, Nigeria.
4. More research work is needed in the area of building a trust between cloud service providers and consumers, offline databases and clientele to focus on issues of data security and data privacy which will enhances efficiency and acceptability of cloud computing and offline databases.

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APPENDIX A:

Sample Library System Vendors with Cloud Services

Company	Name of Product	Type of Product
ExLibris	Primo	Discovery Layer
OCLC	WorldShare	LMS and other products
ProQuest	Intota 2	Library Management System
LibLime	Koha	Open Source LMS
Sirsidynix	BLUEcloud LSP	Library Management System

APPENDIX B:

Table 3.1: Population of the Study

S/No	*Institution*	*E-librarian*	*Library ICT staffs*
1	Ahmadu Bello University, Zaria	125	25
2	Bayero University, Kano	5	10
3	Usmanu Danfodiyo University, Sokoto	8	4
4	Nigerian Defence Academy, Kaduna	1	3
5	Federal University, Dutsin-Ma, Katsina	10	2
6	Nigerian police Academic Wudil Kano	1	2
7	Federal university Dutse Jigawa	1	3
8	Federal university Birnin Kebbi	3	5
9	Federal university Gusau Zamfara	1	5
	TOTAL	155	59

Table 4.1 Response Rate

University Libraries	Copies of administered questionnaire	Copies of returned questionnaire	Percentage %
Ahmadu Bello University Library	150	89	65.3%
Bayaro University Library	15	13	86.7%
Usman Danfordiyo University Library	12	11	91.7%
Total	136	113	83.1%

Table 4.1 shows the breakdown of the copies of the questionnaire returned, that a total of 89 copies of questionnaire were returned from Ahmadu Bello University Zaria while a total of 13 copies were returned from Bayero University Kano and 11 copies were returned from Usman Danfodiyo University Sokoto Library giving an overall total of 113 representing 63.8% of the total copies of questionnaire administered to respondents.

Table 4.2 Distribution of the respondents by job schedule

Job Schedule	Frequency	Percentage
E- librarians	70	61.9%
Library ICT Staff	43	38.1%
TOTAL	113	100%

Table 4.2 show that out of 113 total respondents 70 (61.9%) were e-librarian were 43 (38.1%) were library ICT Staff. This indicate that the majority of the respondent in selected university libraries were e-librarian.

Table 4.3 Distribution of the respondents by years of working experience

Years of Experience	**Frequency**	**Percentage**
1 – 5	**6**	**5.3%**
6 – 10	**99**	**87.6%**
11 – 15	**8**	**7.1%**
Total	**113**	**100%**

Table 4.3 reveals that most of the respondents' years of experience were between 6 to10 with a total population of 99 (87.6%) while 8 were between, 11 to 15 years of experience and 6 were between 1 to 5 years of work experience. This indicates that majority of the respondents fell between 6 -10 in selected university libraries under studied.

Table 4.4 Distribution of the respondents by the qualification

Qualification	Frequency	Percentage
HND	**6**	**5.31%**
B.Tech, B.Sc, BLIS	**45**	**39.82%**
M. Tech, MSc, MLIS,	**61**	**53.98%**
PhD.	**1**	**0.89%**
Total	**113**	**100%**

Table 4.4 reveal the respondents' highest educational qualification and it was found out that the majority of the respondents 61 (53.98%) were holders of master's degree, 45(39.8%) possessed first degree, HND holders are 6(5.3%) were only 1 respondent holder of Ph.D.

APPENDIX C:

FEDERAL UNIVERSITY OF TECHNOLOGY MINNA
SCHOOL OF INFORMATION AND COMMUNICATION TECHNOLOGY (SICT)
DEPARTMENT OF LIBRARY AND INFORMATION TECHNOLOGY

VICE – CHANCELLOR:
Prof. Abdullahi, Bala PhD, fssn,

REGISTRAR:
Mr. A. N. Kolo B. Sc. M. Sc. FHCA, ACIPM

HEAD OF DEPARTMENT:
Dr. K. A. Saka, NCE, BLIS (ABU), MLS (BUK), PhD (UniMaid)

Tel: +234 (0) 80368880881
Fax: +234 (0) 66223275
Telegram: FUTECH, Minna

E-mail: s.katamba@futminna.edu.ng
Tel. 07038706880

11th October, 2019.

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LETTER OF INTRODUCTION

I hereby present to you MUHAMMAD Abdulmuminu a M. Tech student of Library and Information Technology Department with Mat. No. M.Tech/SICT/2017/6767. He is writing his project titled "CLOUD COMPUTING APPLICATION AND OFFLINE DATABASE PROVISION AS CORRELATE OF EFFECTIVE SERVICE DELIVERY IN FEDERAL UNIVERSITIES LIBRARY IN NORTH WEST NIGERIA". Please kindly render him the necessary assistance to enable him complete his research work.

Thanks for your cooperation.

Dr. K. A. Saka
HOD LIT

APPENDIX D:

QUESTIONNAIRE FOR E-LIBRARIANS AND LIBRARY ICT STAFF

Department of Library and Information Technology,
School of Information and Communication
Technology, Federal University of Technology, Minna,
Niger State.
2nd October, 2019.

Dear Respondent,

I am a Post graduate student conducting a research on "Cloud computing application and offline databases provision as correlate of effective service delivery in federal university libraries in North West, Nigeria".

I, hereby solicit for your cooperation to kindly respond honestly to the questions. The questionnaire is meant for research purpose. Hence, all information given will be treated with utmost confidentiality.

Thank you for your cooperation.

Yours sincerely,

MUHAMMAD, Abdulmuminu
MTECH/SICT/2017/6767

APPENDIX E:

Table 4.5 Checklist on Available ICT Infrastructure/Facilities in the Library

S/NO	*ITEMS*	*INSTITUTION*	*AVAILABLE*	*NOT AVAILABLE*
1.	**Computer Systems**	**ABU. LIBRARY**		
		BUK. LIBRARY		
		UDUS. LIBRARY		
2.	**Systems server**	**ABU. LIBRARY**		
		BUK. LIBRARY		
		UDUS. LIBRARY		
3.	**Scanner**	**ABU. LIBRARY**		
		BUK. LIBRARY		
		UDUS. LIBRARY		
4.	**Intranet/UPS**	**ABU. LIBRARY**		
		BUK. LIBRARY		
		UDUS. LIBRARY		
5.	**Internet connectivity**	**ABU. LIBRARY**		
		BUK. LIBRARY		
		UDUS. LIBRARY		
6.	**Speedy local area network (LAN) /Wide area network (WAN)**	**ABU. LIBRARY**		
		BUK. LIBRARY		
		UDUS. LIBRARY		
7.	**Printer**	**ABU. LIBRARY**		
		BUK. LIBRARY		

		UDUS. LIBRARY
8.		**ABU. LIBRARY**
	Photocopier	**BUK. LIBRARY**
		UDUS. LIBRARY
9.		**ABU. LIBRARY**
	Back code Scanner	**BUK. LIBRARY**
		UDUS. LIBRARY
10.		**ABU. LIBRARY**
	Text editors/ OCR	**BUK. LIBRARY**
		UDUS. LIBRARY

APPENDIX F:

UNIVERSITY LIBRARY SERVICE ASSESSMENT WITH CLOUD COMPUTING APPLICATION AND OFFLINE DATABASES PROVISION

QUESTIONNAIRE FOR

E-LIBRARIANS AND LIBRARY ICT STAFF

Section A: Demographic Data:

Please tick (√) appropriately and fill in the space provided

1. Name of your Library……...
2. Designation……Rank……
3. Highest educational qualification……
4. Years of professional experience in the capacity of a e Librarian ▭

▭ ICT personnel

☐ Less than 1 year

☐ 1 - 5 years

☐ 6 - 10 years

☐ 11- 15 years.

☐ 16 – 20 years

☐ 21 years and above

Section B: 1. *What are the available ICT infrastructure/facilities in your library*

Please Tick (√) appropriately

S/No	*ICT infrastructure/facilities*	*Available*	*Not Available*
1	Computer Systems		
2	System server		
3	Scanners		
4	Intranet/ UPS		
5	Internet connectivity		
6	Speedy local area network (LAN)/wide area network (WAN).		
7	Printer.		
8	Photocopier.		
9	Back code scanner.		
10	Text editors/ OCR.		
11	Other(s) (s) Please specify……		

2. *What are the type of cloud computing technology service use in your library?*

Please tick (√) appropriately

S/No.	*Cloud computing Service*	*Available*	*Not Available*
1.	Dspace		
2.	Green Stone		
3.	ExLibris		
4.	OCLC		
5.	LibLime		
6.	Google Drive		
7.	One drive		
8.	Icloud		

3. *What are the type of offline database provided in your library?*

Please Tick (√) appropriately

S/No.	*Offline Database*	*Available*	*Not Available*
1.	CD-ROMs		
2.	E-granary		
3.	TEEAL		
4.	OPAC		
5.	Green stone		
6.	External/Internal hard disc		
7.	Computer server.		
8.	DVD		
9.	Flash drive		
10.	ZIP Drive		
11.	Other (s) Please specify ……		

4. *What are the types of electronic information resources found on cloud computing technology and offline database provided in your library?*

Please tick (√) appropriately

S/No.	*Electronic Resources*	*Available*	*Not Available*
1	E-Books.		
2	E-Journals		
3	E-Theses		
4	E-Conference papers		
5	E-Articles		
6	E- Lecture note		
7	E-Seminar presentation		
8	Other (s) Please specify……		

Section C: ***5****.What are the challenges facing cloud computing technology in relation to effective service delivery in your library?*

S/N	***Problem***	***Strongly Agree***	***Agree***	***Disagree***	***Strongly Disagree***
1.	Inadequate funding of library electronic services				
2.	Poor Internet connection.				
3.	Lack of technical staff to assist the users.				
4.	Techno-stress.				
5.	Slow download speed.				
6.	Anxiety (Technophobia).				
7.	Inadequate users' information literacy training.				
8.	Insufficient number of cooling systems.				
9.	Lack of online registration facilities.				
10.	Epileptic power supply				
11.	Lack of power backup systems.				
12.	Lack of dedicated server in the library.				
13.	Lack of awareness.				
14.	Inadequate security measures.				
15.	Inadequate computer to access the resources.				
16.	Inadequate bandwidth to sustain internet services.				
17.	Attitude of some library staff				
18.	Information overload				
19.	Other (s) Please specify.				

5. *What are the challenges facing offline databases provided in relation to effective service delivery your library?*

Please tick (√) appropriately

S/N	***Problem***	***Strongly Agree***	***Agree***	***Disagree***	***Strongly Disagree***
1.	Inadequate funding of library electronic resources				

2.	Poor Intranet connection.
3.	Lack of technical staff to assist the users.
4.	Limited number of available book titles.
5.	Limited number of available e-journal titles.
6.	Techno-stress.
7.	Anxiety (Technophobia).
8.	Insufficient number of cooling systems.
9.	Epileptic power supply
10.	Lack of power backup systems.
11.	Lack of dedicated server in the library.
12.	Lack of awareness.
13.	Inadequate security measures.
14.	Attitude of some library staff
15.	Information overload
16.	Other (s) Please specify.

6. *What are the relationship between application of cloud computing technology and effective service delivery in your library?*

Please Tick (√) appropriately

S/No	***Gains / Benefit***	***Strongly Agree***	***Agree***	***Disagree***	***Strongly disagree***
1	Cloud computing facilitates quick access to data				
2	Cloud computing improves quality of library services.				
3	Cloud computing reduces space management problems/challenge				
4	Availability of electronic resources.				
5	Adequacy of library electronic resources.				
6	Ease of access to Library electronic resources.				
7	Ease of use of library electronic resources.				
8	Reliability of the library electronic resource.				
9	Availability of electronic services.				
10	Library e-resources awareness services.				
11	Effectiveness in service delivery				
12	Cloud computing helps in high storage capacity				
13	Cooperative intelligence and improved service levels are enabled by the large-scale aggregation of data usage.				
14	Electronic resources can be accessed remotely				
15	Cloud computing enable information sharing				
16	Twenty four(24) hours library services				
17	Other(s) Please specify…….				

7. *What are the relationship between offline database application and effective service delivery in your library?*

Kindly tick (√) appropriately.

S/N	***Gains / Benefit***	***Strongly Agree***	***Agree***	***Disagree***	***Strong Disagree***
1	Using offline database require no network.				
2	Using the library offline database requires less effort				
3	Library electronic links are always active.				
4	Libraries update its electronic resources regularly.				
5	Library provides adequate number of e-resource				
6	Library provides organized collection				
7	Easy access to electronic resource.				
8	Offline database facilitates quick access to data				
9	Offline database technologies help in easy information dissemination				
10	Offline database improves quality of library services				
11	Twenty four (24) hours library services.				
12	Other specify……..				

APPENDIX G:

INSTRUMENT RELIABILITY TEST

What are the relationship between application of cloud computing technology and effective service delivery in your library?

Reliability Statistics

Cronbach's Alpha [a]	*Cronbach's Alpha Base on Standardized Items* [a]	*Number of Items*
0.629	0.767	15

What are the relationship between offline database application and effective service delivery in your library?

Reliability Statistics

Cronbach's Alpha	*Cronbach's Alpha Base on Standardized Items*	*Number of Items*
0.597	0.696	11

What are the challenges facing cloud computing application in relation to effective service delivery in your library?

Reliability Statistics

Cronbach's Alpha	*Cronbach's Alpha Base on Standardized Items*	*Number of Items*
0.861	0.951	19

What are the challenges facing offline database usage in your library?

Reliability Statistics

Cronbach's Alpha	*Cronbach's Alpha Base on Standardized Items*	*Number of Items*
0.857	0.963	15

Over all Reliability Statistics

Cronbach's Alpha	*Cronbach's Alpha Base on Standardized Items*	*Number of Items*
.736	0.844	86