

# Improving Library Operations Using Cloud Computing Technology

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**ABSTRACT:** Frequent changes in Information Technology (IT) had become an issue to every academic institution in providing necessary ICT infrastructures for effective Library operations in Nigeria. The need to constantly update ICT infrastructures and software in academic institutions for education and research purposes is becoming very alarming considering the financial crises in Nigeria. In such a situation, a relatively new concept that is constantly evolving can be adopted. Cloud computing technology has presented itself as a new paradigm that can update the system automatically across the globe in academic institutions, reducing cost and improving effective Library operations. This paper x-rays the concept of library, the meaning of cloud computing and cloud computing models. It also discusses how cloud computing technology can be used to improve library services, the goods and drawbacks of cloud computing technology in Library.

## I. INTRODUCTION

Technological advancement has brought about sudden changes in every facet of life including library sciences. Libraries are now using computers for running services such as Integrated Library Management System (ILMS). Website or Portal, Digital Library, etc. All these services are either maintained by the organization's computer staff or library staff. It involves constant investment on hardware, software and staff to maintain these services and undertake backup and upgrading when new versions of software are released.

As posited by Chukwu and Ahmed (2013), many tertiary institutions in Nigeria are running digital library system with very many servers and licensed software packages that are

actually very expensive to acquire and maintain. E-library gives users an improved access to library services at the comfort of their homes and offices. According to Kutty (2019), users can read library materials and can even conduct researches at homes and offices. This comfort has brought about the era of e-publication for library.

In recent years, the growth and usage of e-library in our institutions has been hindered by poor infrastructures, high cost of running the systems and software development. There is therefore, the need to adopt a new method that is constantly evolving. However, Cloud Computing has emerged today as solution to these problems. Cloud computing is the newest technological innovation that has transformed the way systems are built and services are delivered. Cloud computing has become a major topic of discussion for every business or organization that relies on technology. Anybody who is connected to the Internet is probably using some types of cloud computing services on regular basis. Whether they are using Google, Gmail, Hotmail, yahoo mail, Google Apps, Drop box, etc, they are engaged in cloud computing technology.

As an emerging method of computing, cloud computing delivers virtually computing resources including computer hardware, networking equipment, software, data storage and services via the cloud (Internet) to users. Cloud computing provides libraries with the opportunity to extend their impact. It provides a cost effective way of running and managing digital library. In the words of Kelly (2012), Cloud computing offers many possibilities that can help to reduce technology cost of installing and maintaining digital library. It gives a better and more efficient

way of collaborating among users of digital library within and outside the country.

Many University Libraries today are virtualizing servers and desktops, collaborating with other campuses, organizations and saving money and time.

### Concept of Library

The term library” was coined from the Latin word “liber- which means “books” It denotes the storage and uses of books. It is a place set apart to contain book, periodicals and other materials for reading, viewing, listening, study or reference. According to online dictionary of library and information science (ODLIS), (2019), library is seen as a collection or group of collections of books and or other print or non print materials organized and maintained for use (reading, consultation, study, research etc). Thus, Imbus and Atagher (2013), defined library as a public institution or establishment responsible for the collection of books and making them accessible for users.

Time, modernization and culture are rolling fast, bring along with them, new ideas, new knowledge and new terms. Today, the word ‘library’ seems to be used in many different aspect of life from the physical structure ( i.e. public library) to digital library. Libraries are changing to be dynamic places where librarians help people to find the best source of information, be it book, website or database entry.

In the context of this paper, library could be defined as service oriented agency responsible for the collection of resource in a variety of formats, organization, preservation, retrieval and dissemination of information on demand to the user by the professionals or other experts without any waste of time.

The importance of library in schools cannot be over-emphasized. Library is an important source of knowledge to young minds in schools. It develops the important habit of reading among the students. It serves as a warehouse of knowledge. It equips students with the skill necessary to succeed. It gives the teachers access to relevant curriculum information and professional development materials within and outside the school. Library serves as a central location for all information available.

### Concept of Cloud Computing

The term “Cloud” refers to a network or Internet. It is something which is present at remote location. It is a remote data centre. Cloud can provide services over network. That is public or private networks.

Cloud services are popular with people who want some offsite storage for materials such as family photos or work files. Things you say to yourself in case my house get burned right now, what picture, data, materials, etc, will I really miss?

The term “Cloud computing” when talking about computing is not really new. Cloud computing is a metaphor for Internet. It is an Information Technology (IT) service that provides computing power and storage away from your own organization or company. It is the practice of storing regularly used computer data on multiple servers that can be accessed through the Internet. It is a separate application from its hardware and software dependencies.

According to Microsoft Co-operation, cloud computing is the delivering of computing services including servers, storage, databases, networking software analysis and intelligence over the Internet (cloud) to offer faster innovation, flexible resources and economics of scale. In otherworld, cloud computing is a concept which is Network based computing that provides shared computer processing resources and data to computers and devices and the Network in Internet.

Mathew (2010) defines cloud computing as a style of computing which massively scalable and elastic IT-enabled capabilities are delivered as a service to external customers using Internet Technologies. According to him, cloud computing is a computing technology that allows the users to use the hardware and software applications on demand over the Net without necessarily installing it on the end- user’s computer.

In this paper, cloud computing is seen as a computing means through which users can access their files on any computer, anywhere, anytime through Internet network access on Pay as You go (PAYGO) basis.

Many individuals and organizations are adopting this technology model for Information Technology (IT) services. Its benefits are that it saves them from the burden and risk of constant hardware failure, the worry of software upgrading or backup issues. It also saves the cost of the organization.

### Cloud Computing Models

Ali (2019) classified Cloud computing models into two (2) distinct types. These include: Deployment models and service models.

#### 1. Deployment Models.

This refers to the location and management of cloud’s infrastructure. According to Mate (2016), Cloud Deployment models define

the type of access to the cloud. That is how the cloud is located. He maintained that cloud can have any of following g types of access;

- (a). private cloud
- (b). public cloud
- (c). community cloud and
- d). hybrid cloud.

#### **Private Cloud.**

Private cloud is a cloud model that is owned, managed and operated by a single organization. In other words, private cloud is an internal cloud with restricted cloud infrastructure operated for a specific organization. It is a cloud model that allows systems and services to be accessible only within a single organization.

#### **Public Cloud.**

According to Ali (2019), an individual, business organization or government or a combination of them can own and operate a public cloud. Here, the systems and services and provided and make accessible to the general public. The entire cloud computing infrastructure is controlled by the third party providers. Thus, it is refers to as the external cloud.

#### **Community Cloud.**

This is a cloud model that allows systems and services to be accessible by specific group of organizations that have common goal. It is a cloud provided for exclusive use by a given community of consumers from organizations that have shared issues.

#### **Hybrid Cloud.**

This a combination of private, public or community cloud. It is sometimes refers to as combined cloud. It is a mixture of two or more clouds.

## **2. Cloud Computing Services**

International Data Corporation (IDC), (2008) defines cloud computing services as the consumer and business products services and solutions that are delivered and consumed in real time over the Net. Dhaka (2017) identified three (3) major types of cloud computing services models to include;

1. Software as a Service (SAAS)
2. Infrastructure as a Service (IAAS)
3. Platform as a Service (PAAS)

#### **Software as a Service (SAAS)**

This is a software that is deployed on the hosted service and is accessible via the Net. It is

otherwise called “Software on demand”. Here, software is delivered as a service to the end user who can access it through the Net. The user does not need to maintained the software. That is to say, the user does not need to install the software, manage the software or obtain hardware for the software. All he needs is to try and get connected and use it (Pal, 2014). According to him, some of these web- based applications are free of charge eg Hotmail, Google Apps, Skytype, etc. While some are leased on subscription in a “pay as you go” model. eg Salesforce. Most individuals or business organizations start their journey to cloud computing with remote delivery of email and online backup of business data.

#### **Infrastructure as a Service (IAAS)**

This type of cloud computing service can also be called “Hardware as a Service (HAAS)”. This service model provides access to basic resources such as physical machines, virtual machines, virtual storage, etc. It involves both storage service and computing power. As a consumer, you can install legal software to the server or develop your own operating system, software or applications and make it accessible to your staff and client as you deem it fit. Users can rent a space, store, firewalls and any other forms of hardware and software. Most of these cloud computing services are available on “pay per usage” basis. Here, a customer can scale up or download depending on his need at any time and can only pay for what he has used. Good example of Hardware as a Service (HAAS) is the Amazon’s web services

#### **Platform As A Service (PAAS)**

Here, all the resources required to develop applications and services are supplied from the Net without having to download or install the software. It involves designing, development, hosting, collaborating, database integration and security. PAAS gives development and deployment tools required to develop applications. It is a set of tools and services designed to make coding and deployment of applications quick and efficient.

According to Ali (2019), PAAS is where your operating system such as Windows, Android Operating System, etc are hosted in the cloud instead of being physically put in your own hardware.

#### **How Cloud Computing Technology can Improve Library Operations**

Libraries are changing their services with the introduction of cloud computing technology.

Cloud computing technology has the facilities to access library services anytime, anywhere. Cloud computing technology offers many possibilities for libraries that may improve their operations and thus help reduce technology cost and increase capacity, reliability and performances.

Mate (2016) identified the following to be the areas cloud computing services and applications can enhance digital libraries;

1. Data efficiency
2. Library Automation
3. Website Hosting
4. Community Power
5. Building Digital Library/Repository
6. File Storage.
7. Digital Preservation / Scanning Service
8. Searching Library Data

### 1. Data efficiency

When data are stored in the cloud, it gives several advantages. Common data can now be easily shared among services and users. The need for local storage, maintenance and backups is removed. Agreement can be reached to share data that normally would be considered private to single business or organization. The same data can be stored hundreds and thousands of times across libraries.

### 2. Library Automation

One of the major areas that library is highly improved today through the use of cloud computing technology is automation. With the help of cloud-based technology, every library software update and maintenance can be done automatically by the service providers. Software vendors like **EX- Libras, OSS Lab Polaris**, etc provide cloud computing services such as acquisition, cataloguing, process system digital content, etc on the cloud. These save libraries from finance on hardware, and software purchase, software update and maintenance.

### 3. Website Hosting

The choice of cloud computing technology by many organizations including libraries is to host their website on the third party service provider instead of hosting and maintaining their own service. A good example of a service for hosting websites outside that of the library server and leaving multiple editors to access the site from different locations is the "Google site".

### 4. Community Power

Another great improvement digital library can gain from cloud computing is the opportunity

for collaboration and co-operative intelligence. With cloud computing, libraries can create an online information community network. Libraries can agree to share pools of data for co-operative collection building, co-operative preservation or digitalization, co-operative sharing of materials, etc using social networks like Twitter. All these network services play an important role in building community power.

### 5. Digital Repository.

Repository is a storage location for files such as downloadable software packages or files in a source control system. With the help of cloud based technology, an open access repository where all digital libraries contents are stored are freely available to download and reuse.

### 6. File Storage.

Cloud computing technology offers varying services such as **Drop Box, Sky Drive, Jungle Disk, Google Doc, Google Music, Flickr, Apple Cloud, Amazon Cloud Player**, etc for accessing any file stored in the cloud. These services virtually share the files on the web and provide access to them anywhere, anytime without any special hardware and software. Libraries make use of these services for different purposes.

### 7. Digital Preservation / Scanning Service

With the help of cloud computing, libraries can preserve their collection electronically in the form of coercive. This can be done centrally thereby avoiding duplication.

### 8. Searching Library Data

Online Computer Library Centre (OCLC) is one of the best examples for making use of cloud computing technology for sharing of libraries information. OCLC is the world most comprehensive data-base about library collections. It makes library resources more visible to many people on the web. It is the world's largest catalog. It helps users find items in libraries close to them. It offers very many services related to circulation, cataloguing acquisition and other library related services on cloud platform through Web Share Management System.

### The Goods of Cloud Computing Technology in Library

Cloud computing technology has the following gains;

#### 1. Cost saving

The cost of purchasing hardware and installing functional software is usually very high.

Thanks for the emerging of cloud-based technology. Cloud - based technology saves libraries and other organization from financial troubles. There is no need spending money to buy costly hardware and software. It offers virtual environment at less cost.

## 2. Service Availability

Distance is no longer a barrier to reach out to any library for any data or information or material. Users can access the cloud at any time and from anywhere for any stored data independent of any location.

## 3. Unlimited Storage

Unlike the traditional library and any storage device that is confined to space and cannot take in data more than its limited space. Cloud-based technology has the capacity to store huge data as compared to personal computer or the servers available in the libraries.

## 4. Low Maintenance

Constant updating and other computer issues is no longer an issue. With the use of cloud computing, maintenance is almost negligible.

## 5. Better Mobility

Using cloud- based technology, the staff and other users of the library can connect to the library from anywhere they are rather than to remain present at their desks with pc and internet access.

## 6. User Friendly

Cloud service facility is very easy to use there is no need to worry about complexity.

## 7. Share Resources

Cloud computing allows people within and outside the library to access the resources. Two or more libraries can come together and can put their resources at one place for use

## 8. Easy Access to Information

Users can easily access any information from anywhere and at any time once they are internet connected.

## 9. Backup and Recovery

The process of backup and recovery is much easier with cloud-based technology than the tradition methods. This is because, most cloud service providers are competent enough to hand recovery of information.

## 10. Increased Data Safety

With cloud computer, users do not need to worry about disk failure or disaster at their offices or libraries. All the data are stored in the cloud.

## 11. Lower Software Costs

Using cloud-based technology in the library, there is no need spending money to buy software packages. All what you need is the access to the application in the cloud.

## 12. Automatic Software Updates

Every software needs update. With cloud computing, users do not need to have worry for software update and will not need to spend money when new upgrade or update is necessary.

## 13. Increased Computing Power

With cloud computing, users are no longer limited to what a single desktop computer can do.

## Drawbacks of Cloud Computing Technology in Library

The following are considered to be the drawbacks of cloud computing in Library.

### 1. Security and Privacy

One of the most disturbing issues with cloud-based technology in Library is security and privacy. It is always very risky to handover sensitive information to the third part. In cloud computing, both the data and information management in the cloud are provided by the third party. However, cloud computing vendors assured us that security and privacy issues can be overcome using encryption and other security applications.

### 2. Lock-in

It is very difficult for users to switch from cloud computing service provider to another.

### 3. Management Interface Compromise

In case of public cloud provider, customer management interfaces are accessible through the net.

### 4. Internet Connection Is Required

Cloud-based technology requires internet connection. That is to say users must use internet to connect to their "cloud pc". If however, there is no internet connection, it simply means cannot connect. Hence, impossible to work

### 5. Low Speed Connections are not Recommended

It is important to note that cloud computing cannot work with slow internet connections. This is because; web-based applications require a lot of bandwidth to download large documents.

## II. CONCLUSION

In today's information society, libraries have the opportunity to improve their services and relevance using cloud computing. Libraries can gain several advantage and obtain different way of knowledge through the use cloud computing. Cloud computing approach can simplify the way in which the libraries operate most especially in terms of hardware needs.

Through cloud computing, libraries can co-operatively use the same, shared hardware, services and data instead of hosting individually or separate hardware and software. The can help to lower the total cost of managing library collection and this improve both the library user's experience and library staff workflows.

## REFERENCES

- [1]. Ali, A.K (2019). Cloud Computing in Libraries: Library Philosophy and Practice (e- journal) University of Nebraska- Lincoln.
- [2]. Amol, k. & mente, R. (2017), Impact of Cloud Computing on Education System. International Journal of Electronics, Electrical and Computational System (IJECS), 6 (11)
- [3]. David, S. (2011), Open Source in Cloud Computing. International Journal of Computer Technology & Application, 3 (2), 738-47.
- [4]. Dhaka m. (2017), Important Role of Cloud Computing in the Field of Library Science. International journal of advance research in science and engineering (IJARSE) 6(12), 2007-2012.
- [5]. Goldner, M (2011), Winds of Change: Libraries and Cloud Computing, Product and Technological Essence, 5 (12), 1-13.
- [6]. Goldner, M and Andrew, P. (2011). Libraries and Cloud Computing. Available at: [www. Sla.org/pdf/2011contribpapergoldownpace.pdf](http://www.Sla.org/pdf/2011contribpapergoldownpace.pdf).
- [7]. Imbus, C.O and Atagher, M.A (2013).Meaning and Historical Development of Libraries. In Anyating, GA, utor,J.S and adung, D.A (2013) Basic Concepts in Librarianship For Universes Polytechnics and Colleges of Education, Obudu. Joe Best Printers.
- [8]. Mafe, K.S (2016), Use of Cloud Computing in Library Service, International Journal of Engineering Service and Computing. 6 (5), 4693-4697
- [9]. Online Dictionary of Library and Information Science (ODLIS), (2019). <http://www.abe-clio.com>. Retrieved 21<sup>st</sup> November, 2019.Pal, S.K (2014), Cloud Computer and Library Service: Challenge & Issues.