
CHAPTER TEN

ADOPTION AND UTILIZATION OF CLOUD COMPUTING IN ACADEMIC LIBRARIES

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Abstract

The development in information technology has changed the way by which libraries disseminate information to their patrons. Cloud computing in libraries deal with how libraries are able to carry out their activities over the web. Presently, libraries have embraced web-based method to execute most of their activities in digital format especially in academic libraries. The paper therefore discussed the meaning of Cloud computing, its concept and also the importance of cloud computing, types of cloud computing models available to libraries for storage of large data and its applications into various library services and operations.

Keyword: Cloud Computing, ICT, Academic Library.

Introduction

Cloud computing is geared towards presenting technologies such as cluster, grid and now cloud computing. All these permitted access to huge amounts of computing power. Cloud computing deals with so many computers that are connected to a server, different applications are connected to a remote server and the computers that are connected to that server will be able to use all the applications in any cloud environment. Any web application is cloud because it resides in the cloud. Libraries can hire monthly vendors and enjoy the benefit of the same server. Cloud computing is a conjunction of different technologies that are making infrastructures and some applications. It is one of the best in the 21st century that offers good service delivery, flexibility, other applications like e-mails, web conferencing and relationship management are all tracked in one cloud. It also helps libraries to maintain record data, both private and delicate data. However, most libraries are now familiarizing to this technology in order to have access to digital journals and serve as a host to other libraries. In recent times, the term cloud computing has been a word to be familiar with in librarianship and other fields of knowledge. The National Institute of Standard and Technology (NIST) defined Cloud computing as a model for having a convenient on demand network access to a shared pool of configurable computing resources examples (networks, services, storage, applications and services) that can be used with a minimum management effort or service provider interaction. According to Mitchell (2011) cloud computing is the act of storing, accessing and sharing data applications and computing power in the cyber space. While Lewis (2010) described cloud computing as a distributed computing paradigm that focuses on providing a wide range of users with distributed access to virtualized hardware and software

infrastructure over the internet. Equally cloud computing can be referred to as the ability to use applications on the internet, to store and protect data while providing service which may be e-mails, sales force automation and tax planning amongst others (Sun Microsystems, 2009). (Sahu, 2015) opined that all the information that a digitized system has to offer is provided as a service in the cloud computing model. It also creates new avenues for organizations and businesses that offer services using hardware/software platforms of third party sources. Cloud computing is a web based technology which is a new form of computing and it is a server based technology where libraries are now adapting to this technology for better service delivery.

Concept of Cloud Computing in Academic Libraries

Cloud computing is a web based technology which requires a remote server-based service provided via the internet network. Suman and Singh (2016) observed that cloud computing is a technology with trends that makes infrastructures and applications more dynamic, flexible and usable. It is now commonly used to represent and show the delivery of all software and other computing needs. It makes available online access to everything, from computing power to computing infrastructures, applications, and business processes. These are being delivered to individuals wherever they need them. Libraries all over the world are becoming interested in the deployment of cloud computing technology to enhance their service delivery to their users. It has been posited that, the need for cloud computing in libraries might have resulted from the existing information explosion, problems in accessing the information, save the time of the users and staff, resource sharing problems, problems in library, resource management, complex demand of users and attraction of users towards cutting-edge technologies" (Kaushik and Kumar, 2013). Patel et al (2012) had earlier suggested that there were four core areas in which libraries can implement cloud computing services in their operation. These areas include technology, data hosting services, information, and community. Therefore, there are numerous options in cloud computing for libraries to choose from. Academic libraries can benefit significantly from cloud computing in many areas of their operations. Liu and Cai (2013) noted that libraries will be free from the technical hassles such as server management if their core services become cloud-based. They also posited that considering its scalability, cloud computing can help libraries to address the issue of dwindling financial resources. In an earlier report by Scale (2010), it was submitted that, through the application of cloud computing in academic libraries, librarians can shift focus from ownership and of resources and give full attention to providing access to information through various cloud-based services.

Furthermore, Luo (2013) suggested that academic libraries can deploy cloud-based software, such as QuestionPoint, LibChat, and LibGuides to carry out their virtual referencing service and research guides. Similarly, Cohn et al (2002) suggested that librarians should make use of database and library system vendors that provide cloud computing facilities such as the external server that could be used to host library data and software in the cloud. The deployment of such tools in academic libraries will enable them to yield favorably to the yearning of their users. Corroboratively, Prince (2012) opined that available cloud options that libraries could make use of includes IaaS or PaaS-hosted system operations and explore open sources tools for maximum utilization of this technology for the betterment of Academic libraries. Yuvaraj, M. (2013) explored the application and usage of cloud technology in libraries. Enefu et al. (2015) investigated the basis for the implementation of cloud computing for National Open University of Nigeria (NOUN) library services. Researchers have adopted qualitative research methodology by

formation of focus group consisting five members which included the university librarian along with four information technology professionals and gathered the data. The findings reflected that NOUN library is providing service using all kind of networks. It used cloud computing in services provided to their students; it did not cover the entire student community who are located across the country. Study recommended that NOUN library can provide services through Wide Area Network (WAN) so that users of all study centers can avail the library services under common umbrella. Further they proposed hybrid cloud deployment model for multiple application of cloud computing in university library. Pillai and Seena (2018) discovered the application and awareness of cloud computing technology in Kerala University. In their study, they have taken view points from total 102 professional and semi-professional library personnel and collected data through survey questionnaires. The findings of the study reflected that 42.16 percent of library professional has less idea about cloud technology and majority of the professionals used Google applications in their day to day operations. Study also found that mainstream of library professionals are not aware about cloud service models and only 14.7 percent of them are aware about Web OPAC and journal discovery services. Study suggested that majority of library staff needs to be trained in line with cloud computing technology in library. In the study under taken by Adegbilero-Iwari and Hamzat (2017) reviewed the prospect of cloud computing technology at Nigerian academic library. They proposed Library Service Platform (LSP) as the most important gate-way for implementing this technology at Nigeria. Study recommended that for successful adoption of LSP at academic libraries of Nigeria, library authority must form the research team for LSP, assess the library work flow, review current process and apply recent innovation and technology in library.

Components of Cloud Computing

Clients: The clients are those devices which the end users interact with to manage their information on the cloud. They are usually depended on for the delivery of cloud services. The clients are divided into mobile clients, thin clients, and thick clients. The mobile clients are devices that are easily moved in a wireless network examples are smart phone, iphone, PDA. Thin clients are those computers who do not have internal hard disc drives, where the server does all the work and then displays the information. The thick clients are regular computers with internal hard discs, in this situation, the use of opera, internet explorer, Firefox, are employed.

Services: It includes those services which are consumed in a short time over the internet. It includes web services which can be accessed by other cloud computing components and software.

Data centers: This is usually in a basement. It is a room which is full of servers and collection of all the applications which were subscribed by the users are placed in that room.

Distributed clients: The servers cannot all be housed in the same location. Most often they are scattered in direction but to the cloud subscriber it looks as if all the servers are working from the same direction, and this gives the service provider more flexibility.

Type of Service Models Available in Cloud Computing

Software as a Service: It is a model that allows users to use different applications as hosted services rather than installing them on local computers. It can be built directly on an IAAS (Infrastructure as a Service) platform. Furthermore it offers diverse range of software applications and services which typically are not visible to end users of SaaS application Huth and Cebula (2011). SaaS is a system where

the service supplier hosts the computer code therefore you don't have to install it, manage it, or obtain hardware, the only thing the user does is to connect it and use it. The examples include customer relationship management as service, email, payroll and other software which are being hosted on the web and is not installed on the computer. It generally begins with the delivery of email online and the backup of businesses online.

Platform as a Service (PaaS): This is the software that is used to develop, deploy host run and or manage software applications. This includes support programmer, compilers, code libraries and tools set. It is a foundational cloud delivery service model. It is a middle bridge that serves between as a mechanism for combining IaaS with other services, software development and deployment tools that allow the organization to have a consistent way to create and deploy applications on a cloud or on premises environment Gong et al (2010). This is a service where your operating systems like android, windows, are all being hosted in the cloud, instead of one putting it in your systems hardware, they are being hosted in the cloud. The SaaS layer offers normal remote services which developers will use to build on. This may involve developer tools that are offered from it to create services. In this hardware operating systems, storage and network capacity are hired over the internet, with this system it is feasible to change and upgrade the features of the operating systems frequently. One of the important features of PaaS is that one does not have to invest in physical infrastructure; People from different teams can come together to work.

Infrastructure As A Service (IaaS): In this type of model, organizations outsource by themselves. The equipment is owned by the service provider and run and maintained by them. The client normally pays for the services on per use basis. Network and operating systems are being made available on a demand level. It is a broad network service and a measured service.

Types of Cloud Environment

Public Cloud Storage: In this type of storage, data is stored in a center which is maintained by a separate service provider outside the enterprise. Organizations back up data in public storage and are free from taking care of hardware and software resources which are needed for storage. Also, organizations can generate large data which are running in an organization's premises can be stored in public storage system.

Personal Cloud Storage: In this type of cloud storage, the data of an individual is stored in the cloud and all the information can be traced from anywhere. This type of storage is derived from the public cloud storage. It can also be referred to as mobile storage system because the data in it can be shared across different devices.

Private Cloud Storage: This type of storage is a situation where all the permanent installations in the organization's data are typically managed by the service provider. This system helps in maintaining security and performance concerns.

Hybrid Cloud Storage: This is a mixture of both the Public and Private Cloud Storage system. In this, the critical data of the enterprise is stored in the enterprise's private and public cloud. Cloud computing is a growing trending amongst modern libraries because these days most libraries are automated. Various software is being used by librarians for automation. All the Software used are costly for the libraries to maintain. The software is usually run by license. It is usually very costly and no organization can do it alone, so they usually rely on a vendor. Goldner (2013) opined that cloud computing is differed from others and its advantages to the library are in three basic areas, technology, data and community. Cloud computing is a well-known model for convenient on demand network for

access to networks, servers, storage, applications, and services that can be managed with a minimal effort or service provider interaction.

Application of Cloud Computing in Libraries.

Searching Library Data: OCLC is one of the important examples of the use of cloud computing systems, whereby libraries use clouds services to share information by collaboration. Its services range from circulation, cataloguing, acquisition, indexing, and other related library services which is achieved through a web management system. This is based at maintaining a cost effective and sharing that makes collaboration wider in the community.

Building Digital Library: For easy access to information most libraries have gone digital in order to maintain efficiency. According to Pearce (2005) digitization is the process of transforming analog materials into binary electronic digital especially for storage and use in a computer. This process allows the digitization of almost all types of materials including manuscript, documents, photographs that are not common.

Website Hosting: Cloud computing is usually used to carry out the process of website hosting in libraries and other organizations usually host their websites on third party arrangements. This is one of the earliest applications of cloud computing in the library, usually employed in searching scholarly content. Ali (2019) reported that Kimbus is a cloud based analysis platform which facilitates the searching of publication content, it is devoted to information cloud that is devoted to information discovery and cooperative for researchers and scholars.

File Storage: In order to be able to access a lot of services, cloud technology offers a lot of services like dropbox, jungle disc, Sky drive, VTLS, KOHA, X-LIB and so on. All the above mentioned help in the sharing of files and provide access anytime and anywhere without any special software or hardware. This makes it possible for libraries to build up their holdings using cloud computing systems.

Social Networking Websites: Social networking websites like Web 2.0 e.g. Facebook, LinkedIn, WhatsApp, Instagram, Twitter, Skype, Telegram, and search engines all make use of the concept of cloud computing in their service delivery.

Library Automation: In order to achieve library automation, libraries provides different services using cloud computing for libraries to provide such services like, Cataloguing, acquisition, digital content and it provides a cutting edge for libraries and it also provides some cutting edge technology, which are used in libraries like MARC21, XML, Z39.50. These are related to library and information science. Nowadays third party services are provided by software vendors like Ex-Libris, OSS Labs in the cloud as third party services which provides solutions to libraries.

The Benefits of Cloud Computing

- i. Access to data over the internet: This has been made possible through the use of web based devices like Smart Phones, Tablets, and laptops. The Library will be able to share files fast, with fast access to the web. A person can save large files like photos, videos, presentations, also services like backups are provided to the users in cloud computing.
- ii. It also helps libraries to manage the funds available to them because a lot of money is saved through the use of cloud technology, this is applicable to both libraries and other organization, and they will not need to purchase large equipment with large sum of money.
- iii. In addition, it aids collaboration and sharing of information among libraries which is a cost effective way for libraries when compared to the buying of software and hardware.
- iv. According to Walmiki & Ramakrishnegowda (2009) applications of ICT in libraries enhance users' satisfaction. It provides numerous benefits to

library users. Some of the benefits of the applications are provide speedy and easy access to information, provides remote access to users, provides round the clock access to users, it provides an access to unlimited information from different sources, provides increased flexibility, facilitates the reformatting and combining of data from different sources.

Disadvantages of Cloud Computing

In cloud computing, security has been a serious challenge since it possesses high speed when it comes to sensitive information like medical and financial records. Encryptions are used but when such encryption keys are lost, the information disappears. Most of the servers which are maintained by cloud computing organizations are usually exposed to natural disasters, bugs and power failures, for example when there is a power outage in a nearby town it can lead to another firm losing its data, this happens when the main based provider has crashed. This can be applied to a situation where people are manipulating and accessing information through the same portal, it is possible for them to come across inadvertent mistakes.

Conclusion

Cloud Computing is an approach into the future for academic libraries. It will surely help academic libraries to improve the way they operate and render services better to their patrons. It saves cost for the library in terms of purchasing of hardware and having to pay to connect to the web. Cloud Computing will surely enhance service delivery of academic libraries and enhance resource sharing amongst libraries which will enable them to develop library services and collaborate with other libraries. In this technological era, cloud computing should be one of the basic priorities that academic libraries will consider enhancing their service delivery. The research data/asset of the library will become more useful and visible when it can be accessed beyond and across the globe.

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