



CLOUD COMPUTING: A NEW MODEL FOR LIBRARY CONSORTIUM

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ABSTRACT

The study was an attempt to justify the importance of deploying cloud computing service to manage and run library consortium. The study adopted the Grounded theory search method through detail and extensive bibliometrics analysis as stated in the aims of the theory by the leading proponents of the theory. Based on Allen Kent statement and Ranganathan's Five Laws of Library Science, the study conceptualised and theorised an Library ICT LAWS as a proposal. The study advocate for Library consortium modelled on cloud computing, which has the potential to revolutionized library and information service in the area of information exchange. All that is required is to put in place a system that ensures the acceptance of ICT service and innovation to improve the state of library and information service than what it is now.

Introduction

The availability and application of Information Communication Technologies (ICTs) into library and information service is a paradigm shift that has brought about significant changes in the way and manners with which library and information services are carried out. The change has altered the way information is organized, stored, retrieved, disseminated and shared. The advent of ICTs has equally introduced tools and services with huge potentials to address the challenges associated with traditional library system by positioning the library to effectively participate in global information exchange and information resources sharing activities. The latest, of these numerous ICTs tools and programmes that is so appealing to library and information service is 'Cloud Computing'. Library, from time immemorial, is an institution that requires linkage and partnerships with other institutions and organizations to be able to function properly to meet up with library mandates. The platform for such linkage and partnership takes many forms and different names.

Some of the platforms that bring libraries together have different names and nomenclature, such as library collaboration, library cooperation, library consortium, inter-library loan, library network, and library resources sharing. The essence of such linkage and partnership is to provide a positive net effect: (a) on the library user in terms of access to more quality information resources and services, (b) keeping abreast of the current trend and (c) on the library budget in terms of economic of scale and much more services at less cost than if undertaken individually. In other words, the term is use interchangeably with other concepts and phrases such as 'library resources sharing' 'library networking' library cooperation'.



From whatever perspective one may try to look at it, library consortium represents all activities that occur when two or more libraries work together to provide more developed services to their respective users and clientele. The emphasis is to provide more developed services to their respective users within the limited financial resources and to mutually exchange ideas and expertise for the advantage of the system (library and information service). The role of library consortium in alleviating the inadequacy of information and human resources associated with library services was long realized when library professionals and associations started the agitation for resources sharing activity among libraries.

To paraphrase Asamoah-Hassan (2002), resource sharing among libraries was first principally organized by the Association of Research Libraries (ARL) through a programme called the Farmington plan in the year 1948 in United States. The sharing was among 60 libraries in U.S.A. formulated with the aim of collecting materials from some areas or countries to increase the nation's total resources for research. Based on the assertion by Asamoah-Hassan (2002) it is very clear that libraries have been cooperating and collaborating on collection building for many years. The main objective of library cooperation and resource sharing till today is to maximize the availability of, and access to, information and services at a minimum cost. Regardless of the names given to the platform, be it library cooperation, networking or resource sharing, they are used synonymously with cooperation and collaborative activities of library and information centre (Mannan, 1998). Developing a library consortium requires great deal of planning, strategy, steady funding and unflinching commitment from its member institutions and a firm agreement or memorandum of understanding regarding what resources will be included or meant for sharing and exchange.

However, with best plans, sound strategy and a sizeable budget without professionals committed, no much would be achieved. As established by previous studies, particularly that of Sharma (2010), which articulated that a library consortium is collective activity of a group of libraries towards a common goal of sharing resources. He noted that library consortium activity is a complex process, which involves the wholehearted support and concerted efforts of the librarians, their management and the publishers. Libraries are now enjoying better access to more information resources through meaningful cooperation and collaboration among themselves. Prior to the era of popularizing cloud computing, digital libraries were viewed as a hallmark achievement for managing and archiving the ever- increasing information resources explosion. However, as the publication of research information continued to grow, there came the need to use more scalability, superior preservation measures and on-demand service application, which are the attributes of cloud computing. Therefore, deploying cloud computing to manage library consortia would position the library to deal with the geometric increasing rate and volume of information resources published across the world.

Statement of the Problem

Librarian usually lack behind when it comes to accepting change, particularly since the era ICTs in libraries. The changes which ICTs brought into library and information science continued unabated. Therefore, the professionals have to prepare to always accept change, especially, those occasioned by ICTs. Cloud computing is one of such changes stirring the profession in the face. Therefore, this study is confronted with the task of advocating for the adoption of cloud computing in the library to manage and run library consortium; because it seems much is not known about cloud computing among Nigerian libraries and librarians.

Objectives of the Study

This study sets out to achieve the following objectives, namely to:

- i. identify the need for libraries to adopt cloud computing in managing and running library consortium;
- ii. propose Library ICT laws;
- iii. identify cloud computing model suitable for library and library consortium; and



- v. identify existing literature on cloud computing in library consortium

Methodology

The study employed Grounded Theory (GT) research method as the research methodology for the study. Grounded Theory as an inductive and qualitative methodology relied on systematic generation of theory from systematic research. It is a set of vigorous research procedures leading to the emergence of conceptualization. According Walker, and Myrick (206) Grounded Theory is often heralded as revolutionary in the history of the qualitative tradition. Yet, at the same time, it is the most frequently discussed, debated, and disputed of the research methods. Historically, GT emerged in the 1960s as a result of Glaser and Strauss's sociological research programme, through their work. They crafted a method that enabled the researcher to generalize and systematically put up a substantive theory grounded in empirical data.

Literature Review

Cloud Computing and Library Consortia

The study provides literature review and conceptualization of the two main subject matter (cloud computing and Library consortium) of this study from empirical and theoretical perspectives. According to International Coalition of Library Consortia (ICOLC) (2013), library consortium is any local, regional, or national cooperative association of libraries that provides for the systematic and effective coordination of the resources of school, public, academic, and special libraries and information centers, for improving services to the clientele of such libraries. Consortia conduct their business to advance research and learning, share risk, provide easy access to information, provide high-quality content (electronic resources), enable continuous professional development, strengthen library leadership as education and information providers, and to shape the future.

Ruth, Paul, and Ejiro, (2015) argue that the advances in ICTs have decisively changed the method of operation in the library and learning environment which has in turn transited into information society. This transition has metamorphosed the world today into a fast and massive transformation in social, cultural, political and economic terms. This transformation process affects almost all organisational structures. One of the structures that is affected by this process, is the library with its culturally and socially organisational characteristics as it collects, preserves and disseminates the information and eventually aims to meet the information needs of the society through massive adoption of ICT. Sharma (2010) articulate that a library consortium is collective activity of a group of libraries towards a common goal of sharing resources. He noted that library consortium activity is a complex process, which involves the wholehearted support and concerted efforts of the librarians, their management and the publishers.

Meanwhile, Bushra (2006) observes that resource-sharing, whether formal or informal, is a common practice in libraries across the globe. The concept vaguely started in late 18th century with the founding of American Library Association (1876) and slowly gained momentum in the subsequent decades. It started from shared cataloging, resulting into Online Computer Library Center OCLC (1967). Then in mid 70's, the exponential growth in number of publications and the shrinking library budgets due to financial crisis, gave way to the concept of Cooperative Collection Development and initiatives like Research Libraries Group (RLG) appeared. This led to formation of library networks, forums and consortia at all levels and helped development of the infrastructure for resource-sharing by introducing the development of union catalogs, union lists of serials and refining and formalizing the inter-library loan systems (ILLs) widening them to state wide and international levels and introduced concepts like shared access to library members. Walden (1999) articulates that resource sharing on the other hand has also been used to describe organized attempts by libraries to share materials and information resources and services cooperatively so as to provide libraries with more resources that might otherwise not be available to an individual institution.



Sharma (2010), Walden (1999), Bushra (2006) in their various submissions stressed sharing of resources, for libraries to effectively share their respective resources they require the application of modern ICT infrastructure. That was why Song (2001), stressed that library consortium require 'networking' which is a high-level combination of modern technology, based on computer network, where both the library automation technology and librarianship adopt modern technology (computer technology) as its core instrument in document arrangement, storage, retrieval and delivery. Library network utilizes computer networking technology to support information exchange and communication among libraries and information centers and information users. Zhang (1997) summed it up that "new technology has provided the profession the new playing-field of resource sharing. Computer applications continue to get attention and relevance in library and information services. Similarly, Vasishta, Manider, and Navjyoti (2012), stated that consortia approach has emerged as the hallmark of libraries in order to harness electronic resources effectively.

Cloud Computing

According to Foster et.al (2008), cloud computing refers to a large-scale distributed computing paradigm that is driven by economies of scale, in which a pool of abstracted, virtualized, dynamically-scalable, managed computing power, storage, platforms, and services are delivered on demand to external customers over the Internet. It was described as a specialized distributed computing paradigm; different from the traditional ones in that: 1) it is massively scalable; 2) can be encapsulated as an abstract entity that delivers different levels of services to customers outside the cloud; 3) driven by economies of scale; and 4) the services can be dynamically configured (via virtualization or other approaches) and delivered on demand. There is no universally accepted definition of cloud computing just like many other concepts in the scholarly debates. Yet, Lebeko (2013) defined it as a large distributed computing paradigm that is driven by economies of scale, in which a pool of abstracted, virtualized, dynamically-scalable, managed computing power, storage, platforms, and services are delivered on-demand to external customers over the internet. National Institute of Standards and Technology, NIST (2011), define it as a model for enabling 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.

Based on Lebeko, (2013), Mell (2011), Foster et.al (2008) and Breeding (2012), the librarianship conceptualization of cloud computing may well be that 'cloud computing is used broadly to describe nearly any type of virtualized computing environment where a library relies on a remote hosting environment for a major automation component. It is as much a marketing term as technical one. Cloud computing is the delivery of computing services over the Internet. Cloud services allow individuals and businesses to use software and hardware that are managed by third parties at remote locations. Examples of cloud services include online file storage, social networking sites, webmail, and online business applications. The cloud computing model allows access to information and computer resources from anywhere that a network connection is available. Cloud computing provides a shared pool of resources, including data storage space, networks, computer processing power, and specialized corporate and user applications.

Cloud computing represents one of the most important technology trends of the present time. Every day, people make use of computing and information resources through a web browser powered by some distant and diffuse infrastructure. This model has become routine for personal use-e-mail, word processing, social networking, photo sharing. In more recent months and years, cloud computing has entered the library technology sphere. It brings the opportunity for libraries to shift away from the need to own and operate their own servers to power their core automation applications and to instead shift to gaining similar functionality through web-based services. In order to develop technology strategies in this context, it is essential for libraries to have a solid understanding of this new technology landscape, to move beyond a vague awareness of it to a more nuanced, well-informed understanding of such concepts



as software-as-a-service, infrastructure-as-a-service, and platform-as-a-service and the relative advantages, caveats, and risks.

Cloud computing is the application of tools and services to deliver computing services over the Internet. Cloud computing has become a routine computer activities but most users of computer services are not aware, most of the personal computing activities like social media (BBM, Whatsapp, Facebook) and email account synchronization, including the photographs kept in mobile phones are store on a server by these third parties. Any computing service that allows you to access your e-mail, social networking site or photo service from anywhere in the world, through multiple Internet enabled devices is cloud computing. However, it is very clear that for library to adopt the deployment of cloud computing into library services is as easy as anything but lack of policy initiatives and librarians attitude is the major bottle neck. Wasike and Njoroge (2015), on a study conducted in Kenya argue that cloud computing has taken libraries in Kenya by storm as libraries do not know what to do, because they lack policies to govern them. He went further to say that the realization by information professionals that cloud computing has a critical role to play in the provision of information services has created a desire to effectively harness and manage them for scholarly communication.

Model and Services Layer of Cloud Computing

PaaS: Platform as a service (PaaS) is a cloud computing model that delivers applications over the Internet. It is a model of cloud computing whereby, the cloud service provider delivers hardware and software tools - usually those needed for application development -- to its users or client as a service. A PaaS provider hosts the hardware and software on its own infrastructure. In this model, if library subscribe to any cloud computing service provider, the PaaS cloud computing model would take away the library's burden of installing in-house hardware and software to run library application in whatever area of service.

SaaS: Software as a Service, (SaaS) is a cloud computing model that delivers application over the web, cloud service provider use such model to deliver software applications and the related functionality to their clients. It allows a library to access library related application over the web at a highly reduced cost. Due to the advantages of cloud computing, such software are remotely accessed, the library do not need to install such software again and that serves as cost cutting on the part of the library.

IaaS: Infrastructure as a Service (IaaS) is a model of cloud computing that delivers and provides hardware, software, and equipment as infrastructure (mostly at the unified resource layer, but can also include part of the fabric layer). It also delivers software application environments with a resource usage-based pricing model. Infrastructure can scale up and down dynamically based on application resource needs.

Models of Cloud Computing

Public Cloud: Public cloud is the type of cloud computing cloud computing services, applications and storage are offers to prospective public (users) across the internet 'as a service' for payment or pay as you use or as you go basis. While public clouds are appealing to many businesses and organization as they reduce complexity and cost, because the underlying architecture is fixed, there is less scope for customization for security and performance. Public cloud computing service can be offers as Infrastructure as a service (IaaS), Platform as a service (PaaS), and Software as a service (SaaS).

Private Cloud: Private cloud is the type of cloud computing service where applications, infrastructure and storage are deploy as 'stand-alone' solutions for a single organization like library or library consortium. It may be managed internally within the organization or library consortium or externally, by engaging the

service a third-party. Private clouds offer advanced security feature and other sophisticated feature not possible in a public cloud.

Hybrid Cloud: Hybrid cloud is the type of cloud computing services that combine the features of Public and Private cloud computing. It combines the internal features of Private cloud and external features of public cloud.

Conceptualization/Research Result

The methodology employed for this study allows the researcher to rely on bibliometrics study of the two main subject matter of this research (cloud computing and library consortium) to conceptualise and theorise the outcome of the study. And in line with Allen Kent's statement "the success and survival of libraries will much depend on how much and to what extent the libraries cooperate with each other in future" as cited by Vasishta et al (2012) and Ranganatan (1931) Five Laws of Library Science. Therefore, this study puts forward the following laws tagged: ICT LAWS FOR LIBRARY:

EVERY ICT INNOVATION IS FOR THE LIBRARY!

LIBRARY SUCCESS AND SURVIVAL IN THE DIGITAL ERA DEPEND ON ICT!

ADOPT ICT FOR LIBRARY ORGANISM NATURE TO MANIFEST!

Proposed Model of Library Consortium

The study proposed that librarians and their libraries should adopt cloud computing as a platform for running library consortium on hybrid cloud computing model and on the service layer of SaaS (Software as a Service). The following constitute the need, reasons and justification for adopting cloud computing for library and library consortium:

Cost Reduction and Complexity: Cloud computing service has become popular in the recent time due to its potential for cost reduction and complexity of owning and operating computers and computer networks. Since cloud users do not have to invest in information technology infrastructure, purchase hardware or software licenses, Cloud computing benefits include low up-front costs, rapid return on investment, rapid deployment.

Customization: Cloud computing service allows customization and flexibility of use and gives room for solutions that can make use of new innovations.

Scalability Tendency: Scalability tendency in cloud computing provide the means which enable cloud computing to offer unlimited processing and storage service.

Reliability and Dependability: The cloud is reliable and dependable in terms of access to computer applications be it utilization of hardware and software facilities and documents anywhere in the world via the internet connectivity either through mobile internet (e.g. Table and Smartphone) or stationed internet (Desktop PC).

Efficient and Skillfulness Source: Cloud computing is offers considerable level of efficient and skillfulness in computing service because it is run on platform where there is a poll of experts and resources and it allows organizations to free up resources to focus on innovation and product development.

Privacy and Security: Privacy and security of information store in cloud environment are more and better protected. Loss of information through whatever means in cloud environment is not common.



Threat in Deploying Cloud Computing into the Library

The adoption of cloud computing in library service as model for running library consortium despite all its advantage in managing and running library consortium, have issues that need to be taken into consideration because it pose threat to the smooth operation of library cloud computing. The followings constitute the threat:

Security: Security of library resources in cloud computing environment is a serious concern. Entrusting cloud service provider with library resources could jeopardize library programme. Particularly, as cloud computing service providers host several server and users, they may not provide service that is capable of segregating library resource and data in cloud environment.

Effective Negotiation: Library managers should negotiate well with cloud computing service providers when subscribing to cloud computing service to avoid the experience which most libraries had with library automation software vendors during automation.

Electricity and Power Supply: Cloud computing is a service that is accessible online via internet connectivity and the state of electricity supply would be a strong barrier as most libraries do not have dedicated power generating set. Therefore, running all the clock online computing service requires steady power supply.

Bandwidths and Internet Connectivity: Cloud computing as an online programme or service requires prompt, fast, dedicated and reliable internet connectivity at all time. Most of libraries in the developing world are suffering from low bandwidth, which hinder strong and effective internet connectivity required for cloud computing.

Capital Project: Deploying cloud computing for library service is a capital intensive project that requires huge investments in the initial stage. Most library consortium may find it difficult and if not impossible to mobilize the required fund or convince their proprietor to make such fund available.

Attitude of Librarians: The attitude of library staff including the professional librarian toward accepting change and innovation is worrisome and it poses serious threat to the deployment of cloud computing into library service.

Conclusion

Based on this study, library cloud computing is all about effort put together by libraries to better manage their (libraries) computing service and other ICT related works. It is a system whereby libraries through consortium arrangement engage another outfit (cloud computing service providers) to manager all the library computing services at an agreed terms and conditions, such services ranges from provision of hardware and software services to the library consortium.

Recommendations

The library consortium modelled on cloud computing has the potential to revolutionized library and information service, therefore, librarian should start preparing themselves for the challenges involved in deploying cloud computing into library. Unlike, scenario that played itself where librarian could not effectively add what the researcher called 'librarianship content' in library automation software. Therefore, the paper recommends that librarians should brace themselves up and take leading roles in advocating for Librarianship Content in cloud computing application in library. The librarians should adopt the ICT LAWS FOR LIBRARY as a mechanism to help librarian to take the application of ICTs into library as a serious business. The librarians and their libraries should adopt cloud computing as a



platform for running library consortium on private cloud computing model and on the service layer of SaaS (Software as a Service).

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