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Digital Librarian Competency in Managing digitized Library: A requirement for Cloud Computing Implementation in Libraries

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Abstract

This article appreciates the opportunities made available by Information and Communication Technology tools in the global world and tries to provide a measure by which librarians and library professionals can fully take up responsibilities of managing digitized library in a cloud computing environment. The specific functions required of a digital librarian are been identified via Digital Librarian Cloud Competency Model (DLCCM), bearing in mind skills of Digital Librarians such as knowledge on computer hardware and software that are required to facilitate implementation of Cloud Computing in Libraries. It is believed that competency could be attained by digital librarian via rigorous training and regular application of the ICT tools to any aspect of library functions in either sequential or sporadic manner, and as fast as possible. Suggestions are given to provide guides for digital librarian in establishing coordinated efforts while involving in cloud computing activities where library functions are now beyond space, time frame and geographical location.

Keywords: Library, Digital Librarian, ICTs, Cloud Computing, Computer Competency, Digital Library, Information Age

1. INTRODUCTION

It is crystal clear that information management is taking several turns toward avoiding four walls of libraries and thereby presenting a new approach to its accessibility and consumption. Library professionals are being offered opportunities of taking advantage of Information and Communication Technology facilities to advance in their efforts to making library clientele connected to information resources in the cloud, by utilizing computer and its associative gadgets (Ademodi and Adepoju, 2009; Wada, 2014). The world is in information economy transaction where information acquisition, moderation and dissemination is much like "information-in-the-box", and the question of "where" and with "whom" is more of a mirage (Yuvaraj, 2013). Cloud computing may have derived its name from the acronym CLOUD, which stands as: C for "*Computing resources"*, L for "*Location independent"*, O for "*Online* accessibility", U for "*Utility for users"* and D for "*Demand by users"* (Yuvaraj, 2013). According to Gosavi, Shinde and Dhakulkar (2012), Cloud computing comes into focus only when there is thought about what IT has always wanted, a way to increase capacity or add different capabilities to the current setting on the fly without investing in new infrastructure, training new personnel and licensing new software. In libraries, librarians need to engage in active moderation of the library resources and define the specific users' needs through users needs analysis, monitoring of subscription and usage of the demanded information resources in order to remained useful. Much to that is the acquisition and management of ICT tools such as computers, wired and wireless gadgets and access control facilities that are deployed to allow access to the computed resources in the cloud. This requires that librarians and library professionals need to improve on their competency through training on specific skills and knowledge relating to computer, network and data management. This endeavour definitely would qualify librarians as digital librarians or information scientists with the capability of managing digitized libraries in the fast changing information age.

2. CLOUD COMPUTING

Information age, digital age, cloud computing and virtual clouds are all buzz words describing the period, activities and operations where information are acquired and stored in a system accessible via network. However, the roles of libraries and librarians can well be measured against the success of humanity in using information age technology in the library arena.

Cloud computing is a form of Information Technology with massive embodiment of packages that propagates knowledge wealth and other commodity services, based on demand, in seemingly efficient and effective manner

via networks and web facilities. Information repackaging has now become the new element that is being utilized by cloud computing technology in order to provide new form of services. This is a great change in web-based network-propelled services. The changes being enabled by cloud computing are necessitated by virtualization, democratization of computing, scalability, fast provisioning and commoditization of infrastructure (Diversity, 2011), as a fracture of ICT speedy development. In the light of this, Mell and Grance (2011:6) provided a model view of the definition of cloud computing. According to them, "Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."

Cloud computing establishes a kind of server-client relationship that save the client from the bite of heavy infrastructural deployment, load and cost of servicing by shouldering the responsibility of controlling the required infrastructure, platform and application while improving services ultimately based on demand. Blokdijk and Menken (2009) emphasized that the word 'cloud' has an illusory origin. They pointed out that the origins of the concept "Cloud" can be traced to the concealing nature of this technology's framework in which the system works for users that do not really have the idea on the inherent complexities that the system utilizes. It can be argued that the evolution and revolution in all aspects of Information and Communication Technologies all drive towards the present condition that is affirmed as virtualized networked cloud computing. Improvements in ICTs carry all along with it characteristics embedded in cloud computing today either in part or in whole. The medium of communication between client and clouding system have been termed middleware; and solidly depend on formation of images of virtual machines (Andrew, 2012).

Cloud computing is built to be dynamically responsive and yet with mirage location trances. It emanated from the idea of having total control over tools (physical or virtual and hard or soft), infrastructure, data or information and therefore handing out services, which are requested based on need. In retrospect, cloud computing have been in existence for a while now (Rajan and Shanmugapriyaa, 2012). The technology that is actually propelling cloud computing is the advent of internet, the increased reliability and reduced cost of internet, increased use of web-based applications, demand for applications access via multiple devices using multiple form factors (Goldner, 2010;). According to Gosavi, Shinde and Dhakulkar (2012) the basis of cloud computing is to create a set of virtual servers on the available vast resource pool and give it to the clients on demand. What make the cloud computing services easy to deploy is that any web enabled device can be used to access the resources through the virtual servers. Based on the computing needs of the client, the infrastructure allotted to the client can be scaled up or down synchronously. In more descriptive manner, Ogbu and Lawal (2013) emphasized that Cloud computing offers a new dimension in computing, it changes how we invent, develop, scale, update, maintain and pay for applications and the infrastructure on which they are run. In cloud computing, data and services reside in massively scalable data centers in the cloud and can be accessed through a web browser. It is sufficed to understand that Cloud computing represents one of the most important technology trends of our time.

3. CHARACTERISTICS OF CLOUD COMPUTING

Cloud computing is blessed with certain features that distinctively distinguished it from conventional services rendering in the; some of which are information storage as well as dissemination capabilities and functionalities. Much more of these features are shared infrastructure, dynamic provisioning, network access, managed metering. Infrastructure is owned and leverage out as services for subscription. With cloud computing, applications and programmes traditionally installed and run in a local environment is now performed on the remote system via network known as "internet cloud" (Ben-Yehuda, Ben-Yehuda, Schuster and Tsafrir, 2014). In essence, the Internet cloud becomes the development platform and the operating system to which programmers write reusable, constantly updated software components that are delivered over the network and that can be embedded or loosely coupled with other Web applications. Libraries have been using some cloud computing services for over a decade. Online databases are accessed as cloud applications. Large union catalogs can also be defined as cloud applications (Ben-Yehuda, Ben-Yehuda, Schuster and Tsafrir, 2014).The library community can apply cloud computing to amplify the power of cooperation and to build a significant, unified presence on the Web. This approach to computing can help libraries save time and money while simplifying workflows.

4. IMPORTANCE OF CLOUD COMPUTING TO LIBRARIES

Cloud computing has a lot of significant roles to play in libraries. Neumann (2014) emphasized that the impacts of cloud computing on libraries are enormous and therefore require that the library professional should develop

their management skills to be able to appreciate the turnaround features which it offers. Some of the impacts are: Cost savings, Flexibility and innovation, Broad, general IT skills vs. deep, specialized skills, Cloud OPAC and Cloud ILS and Private Clouds, Hybrid Clouds and Community Clouds.

The next level for cloud computing ubiquity within and outside libraries is a form of collaboration in both networks and resources that are economically viable for uptimised information resources utilization. The efficiency of any arrangement in cloud computing can be measured by the degree of responsiveness and cooperative tendency of the individual library for the benefits of library clientele.

Cloud storage services are also a boon for individual library, most of whom do not back up their computers and mobile devices of their users regularly or at all. Cheaply enough, automatic backup to cloud storage protects valuable data from loss (Neumann, 2014). Generally, the benefits which libraries can derive from cloud computing are identified by Goldner (2010). He asserted that when data is stored in the cloud it offers several advantages and common data can easily be shared among services and users.

a) The need for local storage, maintenance and backups is removed;
b) Agreements can be formed to share data that normally would be considered private to a single business or organization; and
c) Libraries can achieve Web scale when they massively aggregate data and users, something cloud environment makes possible.

Library can immensely benefit from cloud computing via collaboration, cooperation and symbiotic relationships. In the mean time, library can pull together financial and human resources in a way that information could be acquired through plural unionism. These types of formative relationships can be used to spell out certain rules guiding the contributions of each member in the cooperative; and could be used to define the degree of benefits to each to a large extent.
Networked relationship among libraries has the propensity to bring together the interests and needs of all the participating libraries to form a more paying front. Cloud computing posses all characteristic features to facilitate cooperative benefits derivable from togetherness between and among libraries by creating openness to information accessibility and sharing.

5. CLOUD COMPUTING PENETRATION IN LIBRARY

Cloud computing has been in existence for a while now. Some of the aspect of cloud computing is the provision of electronic mail services being offered on demand by Google, Yahoo, Hotmail, Opera mail and many more others. Even though these services do not attract financial commitment, it is understood that they are provided based on demand. This type of mail services constitute element of cloud computing because it is the practice of using a network on remote hosted servers to store, manage, and process and transfer data (Gavelis, 2013). Libraries deploy these mailing services to facilitate Selective Dissemination of Information to library clientele.

Cloud computing is basically divided into three (3) models. They are Software as a Service (SaaS); Platform as a Service (PaaS) and Infrastructure as a Service (IaaS) (Goldner, 2010; Ogbu and Lawal, 2013; DAS, 2013; Shinde and Dhakulkar, 2012) with fundamentals characteristics as, according to DAS (2013) shared resources, on-demand, elasticity, networked access, and usage-based metering. In another development, Ogbu and Lawal (2013) also listed some characteristics of cloud computing to include but not limited to Self-Healing, Multi-tenancy, Linearly Scalable, Service-oriented, SLA Driven, Virtualized and Flexible.

Different scholars, without much debate, have presented the advantages of cloud computing in libraries. Libraries are welcoming the idea of joining cloud computing because of the immediate and future advantages accrued to it. Some of the referenced merits of cloud computing are flexibility, transparency, interoperability, availability everywhere through all times, innovativeness, connectivity, communicativeness, user centeredness, creativity and collaboration (Arokia and Shanmugapriyaa, 2012; Suciu, Halunga, Apostu,Vulpe, Todoran, 2013). In addition to this, other advantages of cloud computing are yet to be discovered and are prone to progress speed of human mind development on and about computer technology. In the main time, cloud computing will create services, values and less efforts from which more successes will be accomplished within shortest period of time due to efficiency associated with robust online services based on demand.
Over the years now, many online web-based libraries have demonstrated huge amount of scenarios that showcase cloud computing operations. Some of these are subscription to databases, online journals as well as online books; some of which are OCLC, Library of Congress (LC), Exlibris, Polaris, Scribd, Discovery Service,

Google Docs / Google Scholar, Worldcat, Encore, dropbox and many more (Jaatmaa, 2010; Sriram and Khajeh-Hosseini, 2010, Yuvaraj, 2013).

Kelly (2011) predicted that cloud computing was going to initiate many activities. In his publication, it was categorically stated that the use of tablet computers would grow; open practices would be embraced beyond the early adopters; Social applications would become ubiquitous; Learning and knowledge analytics would be a growth area; Collective intelligence would be a new buzz phrase (Kelly, 2011). This is undoubtedly true given the level of development in telecommunication, storage, dynamic websites as well as the technology of mobile phones. The trend in cloud computing will be more of e-something and e-everything in addition to e-mail, e-books, e-friends, e-lives (Hill, 2012). The required pursuit of the librarians is to address the mechanisms and approaches of handling their roles and responsibilities in the face of the changes. The worries of budget reduction or finance cut for library operations have already been reduced by the offers presented by Free Open Source Software. According to Hill (2012) Open-source systems in libraries are now seen as an effective way to cut costs by removing the need to budget for expensive upgrades and being stuck with legacy systems. Elspeth (2012) suggested that, since the library is digitally everywhere, there is need for digital librarians to re-configure its operations accordingly to meet the changing.

6. THE SKILLS OF DIGITAL LIBRARIAN IN CLOUD COMPUTING

Libraries are established to serve defined group of users and the central roles of library professionals are to satisfy the clienteles' information needs, at least, to the nearest expected degree. In digital age, the management and dissemination of information take a different approach. With information carriage, storage and dispatching technological development, much changes are registered with respect to library and library users management. The glaring changes propelled by Information and Communication Technology, especially with regards to information resources creation, storage, presentation and dissemination has fiercely shifted the base of library professionals in terms of their roles and operations in the library sector. Both the core library functions such as acquisition, logical bibliographic mapping of information resources metadata and careful representation of such data in catalogue card structure to peripheral functions such as charging and discharging activities have been transformed extensively. These transformations really a telling effects on the skills of the librarians and library professionals.

Dhanavandan and Tamizhchelvan (2014) clearly dichotomized the traditional library settings from ICT supported Library in a well-presented tabular format. According to them, there are twenty (20) areas in the library that enjoy paradigm shift, thus:

S/No	Library	Networked library
1.	Custodian of Books	Service oriented Information Providers
2.	Print	Digital
3.	Ownership	Access
4.	Order in Libraries	chaos on the web
5.	One Medium	Multimedia
6.	Media	Hypermedia
7.	Copyright	copy left
8.	Own Collection	Library without walls
9.	Homogeneity	Diversity (heterogeneity)
10.	In Good time	Just in Time
11.	Top Down System	Bottom down system
12.	Real	Virtual
13.	Tangible	Intangible
14.	Monopoly	Equity
15.	Library	Web Library
16.	Intra-action	Inter-action
17.	Teaching	Learning
18.	Local reach	Global each
19.	We go to the Library	Library comes to you
20.	Book preservation	Bit preservation

These shifts in the nomenclature of library nature and structure are grossly affecting library management and operations in general, and librarians must change their skills and knowledge in line with the changes (Ashcroft, 2004; Jenny, 2013). Librarians, as library managers, though need technical skill, human skill, conceptual skill, presentation skills, communication skills, time-management skills, leading skills, planning skills, organization skills, controlling skills and decision making skills.

In addition to that, the need for IT skills should be a great priority in order to be empowered with ICT competency nomenclature. Patterson*, et al.* (2001) reiterated that computer competency is the knowledge and ability to use computers and related technology efficiently, with a range of skills covering elementary use of computer packages to programming and advanced problem solving tools.

Fisher (2004) analyzes a set of computer skills and traditional roles of librarians and emphasised that in this information age, the librarians will create organizational information management systems, will use the techniques of information architect, will manage access in digital documents and will support every possible learning procedure (Morgan, 2005). Krubu and Osawaru (2011) added that Knowledge about shared folders on self-computer and networked computers; how to configure printers on local computers and networked computers are a necessity.

The main idea behind having deeper and extensive ICT knowledge and skills is to make it possible for librarians and library professional assume full management of library with high efficiency and effectiveness. The enormous roles of library professional and librarians in handling cloud computing services can well be tested against the degree of their computer skills.

7. ACQUISITION OF ICT SKILLS

Ghante (2011), writing on the skills for the 21st century librarian, acknowledged that there is little a librarian can do in the digital age if much efforts and resources are not expended on ICT skills. He, therefore, suggested some important areas of ICTs that librarians need to train in, which are required for successful performance of functions in the library. The suitable way for acquiring these required skills is to leapfrog. Leapfrogging is a process of learning faster than the normal method. Fong (2009:1) stated that, “Technology leapfrogging” refers to the adoption of advanced or state-of-the-art technology in an application area”, that is capable of speedily facilitating the rendering of library services. Veronica (2014) also observed that where immediate prior technology has not been fully adopted, the need for librarians to carefully and tactically jump high over the fence of all hurdles should be entertained. According to Koganuramath and Angadi (2014), the computer skills of a competent librarian fall within certain ranges of Information and Communication Technology and may even go beyond due to rapid changes in ICT trends, metadata standards, web technology, search technology, digital information resources, subject gateways, information portals and Vortals, E-learning (online learning), online information services, digital rights management, Wi-Fi and Radio Frequency Identification (RFID) technology. It is not a misconception to conclude that library professionals are expected to be managers of data and information, irrespective of where they data and information may be stored, via which medium they are transmitted and also whether they are documents based, database, web-based, virtual-based and cloud-based.

There are many strategies, systems and methods that can help build librarians’ skills on the utilization of Information and Communication Technologies. To achieve a speedy result when acquiring ICT skills, Fong (2009) Ghante (2011) and Veronica (2014) share the believe that acquisition of skills necessary for successful delivery of services in the library in a cloud computing age could be done in a more responsive way embracing ICT responsibilities, which entails fast changes in hardware and software.

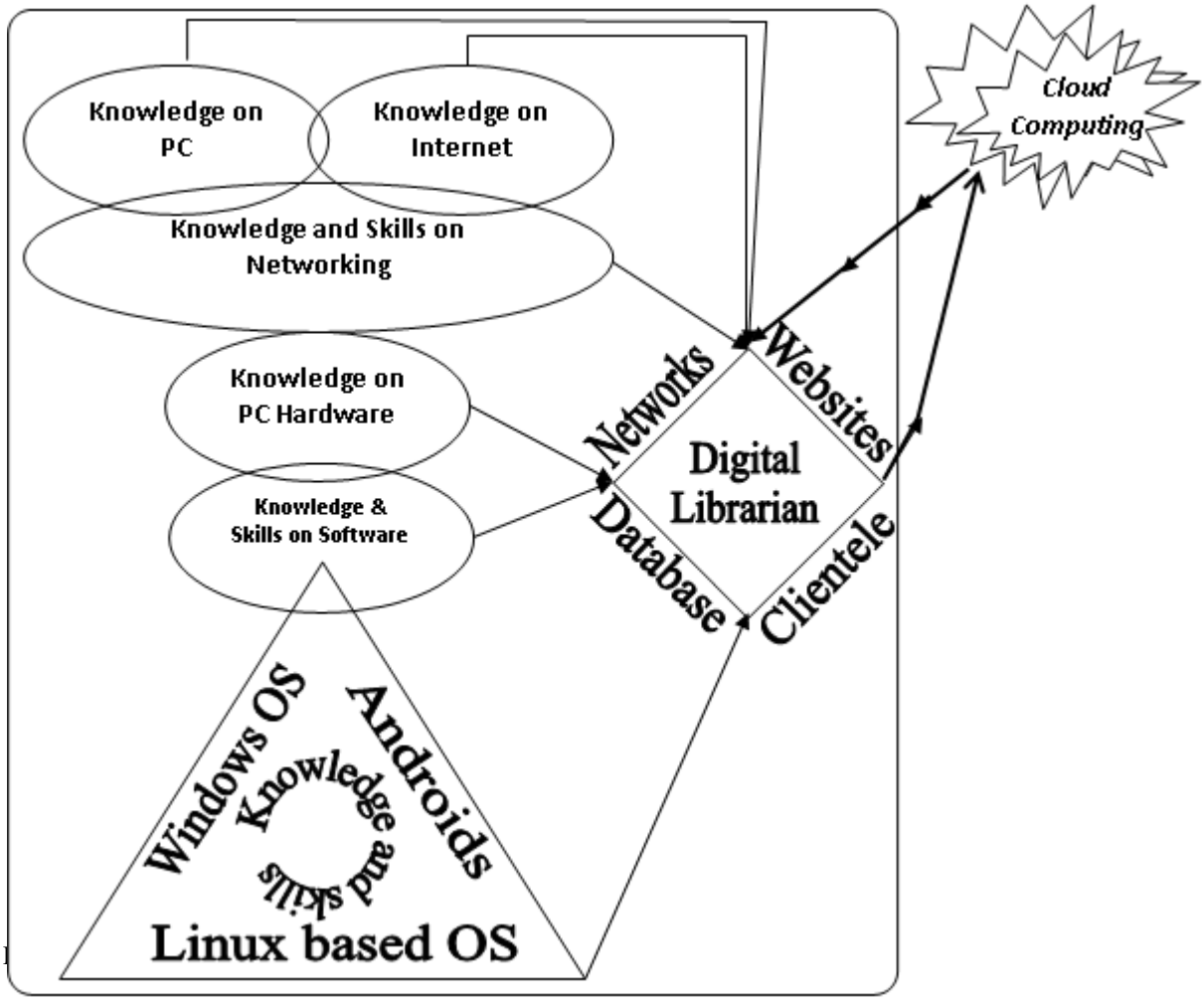
The most essential method for acquiring ICT skills and knowledge is to adopt competency domain model, which stipulates all branches and progress steps as may be required.

8. COMPETENCY DOMAIN MODEL: A GUIDE FOR DIGITAL LIBRARIAN

Competency domain model expresses the hierarchical progress of ICT knowledge acquisition in a top down order signifying the simplest starting point to the complex and wider areas of computing. It emphases that librarians need to first have basic knowledge on personal computer in order to have an understanding about how computer systems can be applied to library activities. By extension, librarians can progress into acquiring knowledge in the field of internet operations and usage. By practice, the knowledge on PC and internet would provide a ground for appreciation of networking, which encompasses the scenario of connectivity, sharing and cooperation using both digital and analog technologies. As progress is made on networking knowledge, it is

necessary to acquire knowledge on hardware and software aspects of ICT tools to be able to appreciate the intensifying needs and requirements of collaboration on sharing resources via cloud computing. Furthermore, knowledge on Operating System is necessarily important to be able to increase satisfaction of the information needs of library users in an electronic or digital age through the provision of guided services and monitoring.

Structure of ICT Competency Domain Model for Librarians and Library Professionals



To attain the class of digital librarian, in digital information age and cloud computing trends, the idea of Soren (2013) needs to be adhered to, where he posited that any organization can change the game through breakthrough innovation – by creating or doing something radically new or different that produces a significant leap forward. Libraries can only be more useful and continuously be visited by clientele if its digital librarian assumes multiple roles that emerge from having the required knowledge and skills that matter in the specific fields of ICTs such as Personal computers, Internet, Networking, Computer Hardware, Computer Software as well as Operating Systems. Cloud computing may be reducing loads associated with investing on infrastructure but less developed and developing countries also need to appreciate the dwindling economy crises that are bedeviling their efforts to enjoy the opportunities in the cloud settings. Participation in the cloud computing by librarians can enhance the presence of information loaded in the space for widespread utilization. Extensive ICTs skills are prerequisite. Library professionals can provide huge contributions by way of utilizing and encouraging the use of cloud computing in the sectors under their management.

8.1 Personal Computer Knowledge

A personal computer is known to be one of the best inventions of mankind. Computer has undergone many changes with respect to size, functions, memory space, and portability. Computer is an extraordinary apparatus

because of its ability to store information and process huge amount of information that is used to perform various technical tasks as well as used to create gadgets. They are various types of computers such as personal computer, notebook or laptop, desktop, netbook, workstation, personal digital assistants, server, mainframe, supercomputer and wearable.

There are few areas on computer that knowledge really matter, some of which are: Search engines, Word processing, Spreadsheet, Browser basics, Virus/malware scanning, Common keyboard command, Basics hardware terminology, Simple network diagnosis, Connecting a computer to network, Security and privacy.

8.2 Internet Knowledge

Macaulay (2006) observes that one important skill required of a librarian is Internet knowledge. Before a librarian can guide library clientele on how to use Internet he must have deep knowledge about how to carry out successful. He must be conversant with how to save time when searching for information and how to identify the right information when found as well as how to navigate the web; how to download files; how to copy text from website and paste in another application software; how to upload files into a database and an email (Partridge and Hallam, 2004; Bohyun, 2011); how to create account with website; how to open several websites in different Tabs and Windows (Nwachukwu, 2004); knowledge of domain name structure; knowledge of what can and what cannot be found on the Internet; In browsing for information materials, librarians should have a clear knowledge about the notion of precision vis-à-vis recall.

8.3 Networking Knowledge

The needs to possess knowledge on how to manage networks are being upheld as highly significant for proper library management in information age (Turner, 2012). Specifically, connection of two or more computer through Networking tools, Internet Protocol (IP) as well various basic configurations will help digital librarians (Steven, 2006) shoulder full responsibilities in a resources networked environment. More to that is how network operates (Ashcrof, 2004), what is needed to put a computer on a network; what network interface card and data cable are, how to connect to wireless on PCs with various operating systems (Bohyun, 2011); how to determine if internet connectivity problems are network problems, computer problems or web site failures; what an IP address and subnet mask are; what Dynamic Network System-internal and external (DNS), Network Address Translation (NAT), Virtual Private Network (VPN) are and what proxy server does, etc. (Bohyun, 2011; Jenny,2013).

8.4 Hardware Knowledge

It is important that librarians have fare idea on how computer systems are joined together to work; especially the components within computer systems ranging from motherboard to other parts such as RAM and power packs. Nwachukwu (2004) stated that a digital librarian needs to be equipped with: knowledge about Central Processing Unit (CPU), which implies– understanding where USB/Firewire port is; understanding of mouse, keyboard and monitor; knowledge on barcode scanner plug; knowledge of mp3 players and iPods; knowledge on printers and how to troubleshoot printing problems; knowledge of thumb drives/flash drives; Knowledge of projectors; Knowledge on web applications Software.

Bohyun (2011) states that in the age where library and library resources are formatted into electronic categories and are managed with computer gadgets the computer competencies of librarians must cover a high range of Information and Communication Technology tools and their operations.

8.5 Software Knowledge

Different software are today applied to library functions. From simple routine of clearance to complex functions of digital bibliographic mapping of information resources as well as daily activities of office operations, software are being used. Given the fact that all conventional library roles and functions are being replaced in the functionalities of different software, there is no room for library managers to slowly embrace the changes, which requires acquiring enough knowledge and practical skills on the applications of the software. Some of the notable software are Content Management Systems (Joomla, Drupal, etc), Library Management System (e.g. CD/ISIS/ Greenstone, NewGenLib, etc. and System software such as Linux, Solaries, Zorin and host of other FOSS.

8.6 Operating System Knowledge

In this information age, the success of librarians and library professionals solidly depends on the volume of knowledge and level of skills on Operation systems. It is suffice to state that whatever software required facilitating the activities and operations of libraries cannot be utilized in isolation without the help of OS platform. At this moment, there are many operating systems, mostly used in offices and homes as well as in mobile systems and machines. Though, there is no unique meaning of operation system nor are there any unified and acceptable functions of OS, but there is general agreement that the functions of Operation Systems are far transcendental and overwhelming. It can be construed that an operating system performs many functions (Athena, 2009). It is known to be the lowest level of software and manages all basic operations of the computer. Among the jobs that they handle are hardware resources, secondary storage such as disk drives and optical disk readers, memory, and allocates time and resources on the central processing unit (Williams and Sawyer, 2007; Athena, 2009). Operating Systems also handle system security, including direct and remote access; file storage, and provides a user interface to all aspects of the computer. All software applications are written to run on a particular operating system (Athena, 2009). It is highly important that managers of libraries adapt to the need of the times and library users desires.

8.7 Digital librarian and His Basic Rolls

A digital librarian would perform a pool of functions in terms of the services that are rendered via the Information and Communication Technologies in the library. These services are mostly possible with the use of computers and its accessories. The formation of digital library was a response to the turn of focus to the business of information dissemination in a soft format and probably via web page channel and digital gadgets. As reported by Trivedi (2010), the concept of digital library was popularized by the NSF/DARPA/NASA Digital Libraries Initiative in 1994. The DELOS Digital Library Reference Model defines a digital library as organizations that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily available for use by a defined community or set of communities (Shiri, 2003). Based on this idea, digital librarians are saddled with responsibilities that spans from the management of IT Infrastructure, Digital Collections, Systems functions and operations, Telecommunication facilities, Human resources, upgrade and updates as well as cooperation and alliances.

The Structure of ICT Competency model shows that digital librarian is surrounded with rolls designed in forms of tasks and responsibilities emanating from managing websites, networks, databases and clientele. Good knowledge on how to manage theses structure will definitely enhance his efficiency and effectiveness in operating in cloud computing. The cloud computing activities will bring about ultimate impacts on the clientele if the knowledge of digital librarians perfect their skills and knowledge on websites, networks, databases, and clientele. Due to the degree at which technology is expanding, there is need for librarians to leapfrog in acquiring the knowledge and skills on such knowledge. Digital Librarian can sufficiently manage library resources and clientele.

8.8 Cloud Computing

Digital Librarians have a lot of responsibilities placed on them by cloud computing. The relationship between the providers of services such as Software as a Service (SaaS), Platform as a Service (PaaS), Infrastructure as a Service (IaaS) and Unified Communications as a Service (UCasS) and that of the clients can be more pleasant if digital librarians' perfect supportive skills. This is because, given the library users various information needs, the role of digital librarians must includes managing the systems via which library users are able to use the services. With cloud computing offerings, digital librarians need to improve on their skills and knowledge on computing, computer hardware and computer applications that are relevant to library operations in order to provide an enabling environment, circumstances and gadgets for library clientele. Using Competency Domain Model as guide, a digital librarian can focus on the specific skills required and necessary for becoming a competent manger of library's electronic information resources and resources users. For digital librarians to excel successfully, the realization that they are embodied with Networks, Database, Websites and Clientele, which they must manage in a digital age should be considered most useful. This realization would serve as a propelling force in leapfrogging in the course of acquiring computing skills and knowledge.

Undoubtedly, in cloud computing, digital librarian is blessed with such responsibilities of managing a pool of information resources, providing efficient and effective services to clientele, minimizing time wastage on assisting users to get the right information, managing information accessibility strategies and ensuring that library clientele get required satisfaction on resources usage and many more. These functions can successfully be performed only with essentials skills and knowledge on PC, Internet, Networking, PC hardware, Application software, System software as well as how to combine all these knowledge and skills to champion the implementation of cloud computing services to a degree as may be required based on library budget.

9. Conclusion

Cloud computing is emerging fast with merits and demerits. Digital Librarians need to be aware of the implications of the changes facing their roles and functions within the library sector and globally, and therefore must develop technological and managerial skills, which will enable them make effective use of Information and Communication Technologies (ICTs) to meet the library institutions' changing information needs in the cloud computing timeframe. Cloud computing is a technology of infrastructure building, information storage and services rendering over network with defined rules that stipulate how to demand for the services, how the services are provided, the time frame for the services and the conditions surrounding upgrading and shrinking of prices as well as users level of satisfaction. Given the Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS) and Resources as a Service (RaaS), cloud computing is placing the end-users at a crossroad where the users need to have knowledge on client side machines operation and how they are managed, how services could be redistributed to other sub-users just like services delivery in the library sector. Notably in library setting, service rendering is a function of services availability and accessibility. Therefore, librarians would have to manage library clientele and their respective needs in relations to the services to which library subscribed to from cloud computing. This requires essential knowledge and skills, especially on ICT tools that support cloud computing. The effective and efficient management of the library users' needs will depend on the types and degree of the services that are available to libraries. The contributions of Librarians and library professionals can well be measured immediately and over time based on how much satisfaction library clientele are able to maximized.

It should be expected that the changes during the cloud computing age may not be complete and absolute in itself, because during the transition, systems similar in behavior and not in capacity to cloud computing will still be deployed by libraries. Therefore, many libraries may find themselves in hybrid operations, inculcating cloud computing along with home based cloud machines in form of supplement. This fact alone places additional responsibilities on digital librarians to enhance on skills and knowledge in the Information and Communication Technologies necessary for cloud computing implementation in the libraries.

10. Recommendations

1. Librarians should always test out software. This could be done by downloading and using any useful software including the paid ones for library operations by trying the trial versions, which may allow usage for up to month.

2. Installing and running different Operating Systems through the use of is Virtual Machines especially that of Oracle VM Virtualbox, is a good move towards perfecting skills and knowledge on the usability of windows and Linux operating systems.

3. Librarians need to deploy different Free Open Source Software (FOSS) that are relevant to library operations and functions regularly. There are many of them, some of which are Structured Query Language (SQL), Content Management Systems (CMSs) Openoffice, Audacity, and many more.

4. Having access to Internet will also provide an enormous opportunity. Search Engines can be utilized in search anything of interest relating to functions and responsibilities of librarians as well as new ICT tools, whether software or hardware.

5. Regular training and retraining on installation of different routers, switches, various communication media, Utility Programs as frequently as possible are other good options. Good skills and knowledge on network and networking are essential prerequisite for managing digitized libraries in cloud computing age.

6. All library sectors are expected to begin to implement cloud computing systems so as to get familiarized before the implementation of the system.

7. Before the implementation of the cloud computing technology consideration should be given to privacy issues and all levels of security issues.

8. All unavoidable factors that could militate against cloud computing implementation such as Internet services, electricity light as well as able personnel should be resolved before engaging in cloud computing system implementation in the libraries.

9. Libraries need to refrain from completely depending on the information and services being provided via cloud computing technology and embrace the creation of complementary alternative and similar systems as a way of contribution so as to be in position to partner rather with other similar institutions on information and services sharing.

10. Digital librarians need to engage in a consistent, continuous and highly advanced researches that will enable them participate and make huge contributions to the development and utilization of cloud computing systems both for the libraries they manage and other similar institution outside there.

11. Librarians and library professionals should expand their areas of research on cloud computing to include issues such as transmission of data, retention and backups, application access and server layering as well as certificates/cryptographic key management.

11. **References**

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