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Library Services Platform Path to Cloud Computing Adoption in Nigerian Academic Libraries: A Review

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Abstract
The library and Information science (LIS) profession have evolved over time taking advantage of prevailing technology. The arrival of computers and other communication technologies led to major changes in the ways library services are rendered and the profession practiced. Library Management Systems (LMS) is one of such earlier areas where ICT have been applied to the operations of the library during the library computerization era. The arrival of the renascent Cloud Computing is generating new areas of research in relation to librarians' uptake of this new technology. Cloud computing is being leveraged by developers of library systems to facilitate the envisaged move away from ILS/LMS to a more robust system that can handle some of the shortcomings of the ILS/LMS. These new systems are called Library services platforms (LSP). While both established and new library systems vendors are turning out different products, libraries have begun to shift away to these new platforms. This paper reviews cloud computing in libraries and projects LSPs as the reliable path to its adoption in Nigerian academic libraries. Recommendations were made based on the outcomes of this study.

Keywords: Library services platform, Cloud computing, Library management systems, Integrated library systems, Academic libraries, Nigeria

1. Introduction

Prior to application of Information and Communication Technology (ICT), the tasks in the libraries were performed manually and independently from one another. Tasks such as collection development, cataloguing and classification, circulation and reference services, current awareness (CA), selective dissemination of information (SDI), and other bibliographic services were being carried out manually and far from one another. However, with the embracement of interdisciplinary concepts such as computer software/hardware and telecommunication engineering and technology, the services in the library are better carried out through the use of integrated library system. An integrated library system (ILS), also known as a library management system (LMS), and henceforth referred to as ILS/LMS is an enterprise resource planning system for a library which is used basically to track items owned, orders made, bills paid, and records of patrons who have borrowed library resources at one time or the other. The ILS/LMS which on one hand has hitherto recorded a commendable success with libraries' print resources, has on the other hand be failed to help libraries manage their ever rising and user-preferred electronic resources. Also, most of the ILS/LMS are usually hosted on local servers and managed by local library personnel or contractors. More often, libraries usually needed to also deploy other tools for search and discovery of their e-resources. Also, the inability to guarantee 24/7 availability of ILS/LMS servers especially in libraries in countries with under-developed and developing economies like Nigeria due to recurrent power outage and/or high cost of electricity supply and rapid change in technological advancement constitute major setback for the further embracement of ILS/LMS. Given the peculiar limitations stated above, they are now becoming unfashionable and being replaced with the newer library system known as Library Services Platform (LSP).

Whereas not all libraries in Nigeria have deployed the ageing ILS/LMS a ground however must be prepared for the adoption of the newborn library technology. This paper therefore seeks to review literature and also point out how Nigerian libraries can derive optima benefits from the renascent cloud computing services upon which LSP thrive.

Cloud computing can be viewed as a model for enabling 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 (US National Institute for Standards and Technology, 2009). It is a platform that can dynamically provide, configure and reconfigure servers to address a wide range of needs, ranging from scientific research to e-commerce. The cloud computing infrastructure resides in a large data center and is managed by a third party, who provides computing resources accessible by anyone, anywhere with an Internet connection. There are a wide variety of cloud computing services but the most likely to be useful to libraries and other organizations are Infrastructure as a Service, Platform as a Service and Software as a Service (Ryan, 2012). The consolidation of computing resources may yield many benefits deriving from centralized management and economies of scale.

In spite of the advantages of cloud computing in reducing cost of managing information resources, the preliminary investigations of the researchers by observation revealed that quite a number of academic libraries have not being exploring the advantages of cloud computing or rather put that there is still dart of placing the systems for the management library workflows alongside the cloud computing as most libraries in Nigeria, if not all, are still stuck with the fading client/server based ILS/LMS. It is on this note that this study is being carried out to present the LSP route for the massive uptake of cloud computing by Nigerian academic libraries

and thus showing the path for the adoption of modern library technologies for efficient and effective service delivery.

2. Objective of the study

The main objective of this paper is to review the use of cloud computing in academic libraries and how libraries in Nigeria can leverage on the technology through the new library services platform.

3. Materials and Methods

The paper is based on a review. The review was done through the search and review of extant literature on the key words of the research topic. The keywords used include: cloud computing in libraries, cloud computing, integrated library system, library management system, library services platform and so on. Google Scholar, Google Search and other notable databases were searched using the keywords. The review was also situated in a notable but related theory.

4. Literature Review

4.1. Cloud Computing.

Cloud computing was invented in 2002 by Amazon, a leading e-business organisation, which had invested in a fleet of huge machines. The concept was designed to handle heavy load of orders made on their site at the time of Christmas which could have caused downtime at their website during this period (Grossman and Gu, 2009). Since then, Amazon has invested heavily in this area and continues to expand its fleet and services. Recently, other players in the IT world such as Google and Microsoft, in turn, offer similar services. These cloud services offer enterprise customers of IT resources, data centre, hardware and software for virtualisation.

According to Etro (2009), the initial adoption of cloud computing solution started in the U.S., followed by the countries of the European Union, and now by some developing countries including the most advanced Asian and Latin Americas.

Furthermore, the result of a recent survey conducted by International Data Corporation (IDC) manufacturing insight (2012) indicated that the ease, speed as well as cost of reduction of IT staff are the top drivers for cloud adoption among manufacturers in Asia/Pacific Countries Excluding Japan (APEJ). The report showed that only 16% of the respondents surveyed acknowledge these top drivers as forces for cloud computing adoption. They also reported that 59% of public sector respondents in Asia are confident that their IT departments are capable of deploying private cloud environments. In addition, 69% of IT decision makers across the region indicated that they have budget assigned to cloud computing.

In a similar development, Omwansa, Waema and Omwenga (2014) reviewed the adoption state of cloud computing across African continent and reported that South Africa, Kenya and Nigeria are the leading countries in the use of cloud computing in Sub-Saharan Africa as of the year 2013. They further analysed the report of a survey carried out by Cisco and World Wide Worx (2013) which found that 50% of South Africa's medium and large businesses were using cloud services, compared to 48% in Kenya and 36% in Nigeria.

In a study conducted by Information Telecommunication Union (2012) to reflect the position of African countries on cloud computing. They submitted that there are very many initiatives by individual countries to upgrade and revise legislative and regulatory frameworks. Particular emphasis was placed on transposition to the national level of regional or international texts on data protection, revision of the relevant legislation to take account of the status of data hosted in the cloud, strengthening of legislation, codes of conduct and standards applicable to the

ICT sector; as well as the clarification of relations between data centre managers, cloud computing and data protection. They however concluded that a number of African governments had taken specific initiatives to promote cloud computing in their countries.

Cloud computing has been identified as an affordable option which creates efficiency and effectiveness, reduction of costs involving electricity, bandwidth, operations and hardware which does not require functional staff, in-house expertise, space, power and infrastructure to perform (Susanto, Almunawar and Kang,2012). Ahmed and Abraham (2013) highlighted cost reduction, relief from managing complex IT infrastructure, flexibility, and scalability as some of the advantages of cloud computing adoption. Yeboah-Boateng and Essandoh (2012) in their study of cloud computing usage among small and medium enterprises in developing economies found cost reduction on IT infrastructure and maintenance, improved communication, scalability and business continuity as the main drivers of cloud adoption. Biddick (2008) remarked that the most likely applications to migrate to cloud computing are storage and business applications, while specialised information technology applications, such as security, management, or compliance, are far less likely to migrate to cloud computing. Greenberg (2008) reported a widespread interest and growth in cloud computing.

However, Greenberg (2008) observed that in spite of the advantages the individual as well as organisations derive from movement toward transitioning computing and storage applications to cloud computing, there are some applications that organizations are choosing not to transit. These applications are especially noted in the area of mission critical applications, which are expected to be retained by their owners rather than being transitioned to the cloud. Another concern raised by the author includes the legal restraints. He pointed out that there are

some legal restrictions prohibiting movement of some vital information such as health care information.

4.2 Library Systems and Cloud Computing

Library management system is a computerized system which helps user (librarian) to manage the library daily activity in electronic format. It reduces the risks of paper work such as file lost, file damage and time consuming (Dinesh, Pravin, Aravindhan, and Rajeswari, 2015). Library management system usually comprises a relational database, software to interact with that database, and two graphical user interfaces (one for patrons and the other for library managers). Most library management systems separate software functions into discrete programmes called modules and each of the modules integrated with a unified interface. Examples of modules might include: acquisitions (that is used for ordering, receiving, and invoicing materials), cataloguing (classifying and indexing materials), circulation (lending materials to patrons and receiving them back), serials (tracking magazine and newspaper holdings) as well as the OPAC (public interface for users).

In integrated library system, each patron and item has a unique ID in the database that allows the ILS to track its activity. Library management systems could be commercial or customized. The commercial library management systems are the type readily-available for the use of libraries, while the customized library management systems are the type being specifically designed base on the users' needs. The examples of the LMS include KOHA, Greenstone, IN-MAGIC, VIRTUAL and a host of others. More importantly, with the explosive growth in the use of library management system, the need to maximise the use of available resources and minimise

costs begin to receive attention. One area of growing interest is the use of cloud computing to consolidate computing and information management functions of the libraries.

Existing ILS/LMS contain limitations in serving today's digital environment (Grant, 2012). According to Chad (2015) "The conventional library management system/integrated library system (ILS/LMS) has only ever managed a part of the business of the library". Li (2014) observed that the unavoidable change of information world and the higher expectation of library users propel the library management systems vendors to pay attention to what is happening to the industry and the consequence if they fail to keep up with the change. The appearance of some next-generation LMSs reflects the LMS providers' adaptation to the change. So far, the paradigm of the new Integrated Library System (ILS) development that echoes the ideas of next-generation ILS contains two layers: a web-based automation system that fully supports the library operation and a discovery service that replaces the traditional OPAC. Also, Nelson (2012) opined that "over the next few years, enterprise and cloud level content management systems will replace traditional integrated library systems". This is line with Pace (2009) who averred that scalable web solutions and technologies like cloud computing is needed ahead of a stagnant ILS to ensure the future of libraries. Library services platform, which are recent library technologies and are cloud-based have now answered most of the problems inherent in traditional ILS.

Affirming Cloud as a major attributes that distinguishes a LSP from a ILS/LMS, Chad (2016) in his briefing paper titled "Rethinking the Library Services Platform" highlighted the problems associated with conventional ILS/LMS which cloud computing capabilities of LSP have help solved. For instance, he reported that ILS/LMS are usually "installed in hundreds of libraries in multiple versions, on a variety of hardware using different operating systems; each new release

must be tested with all these variables and then implemented in each separate library system. This is time-consuming and takes up significant vendor and customer resources. It also militates against interoperability" (Chad, 2016). This agrees with Ramesh and Yadagiri (2012) who conducted a study on the use of cloud computing in solving problems facing library and information centres in India. They reported that library and information centres will benefit in terms of reduced running cost, scalability, innovation and librarians' skills improvement, provision of tag cloud for collection identification and limitless of opportunity for libraries to build and manage their own data centres. Furthermore, Abidi and Abidi (2012) presented cloud computing as a novel application in libraries and reported that implementation of cloud computing will help libraries to keep track of the latest available literature on different subjects. They also reported that if libraries can integrate their data, there would be no more duplication since the libraries would be sharing the common data. Furthermore, they asserted that the need for maintaining and backing up the data will be no more the responsibility of the libraries since all the data will be stored in the cloud which shall be managed by some cloud provider.

Besides, Kaushik and Kumar (2013) have identified key areas libraries can deploy cloud computing. These include: building digital repository, searching library data, file storage, searching scholarly content, building community power and library automation. On library automation and cloud computing, they reported that "many of the software vendors such as Ex-Libris, OSS Labs are also offering this service on the cloud and third party services offering hosting of this service (SaaS approach) on the cloud to save libraries from investing in hardware for this purpose."Iles and Ertuk (2015) corroborating the above reports found that many library vendors have changed to cloud-based services. OCLC's WorldShare Management Services has

been widely reported as the foremost cloud-based ILS (Kaushik and Kumar, 2013; Iles and Erturk, 2015).

4.3 Cloud computing and Library Services Platforms

The Library services platform is a Web-based, clientless system in the cloud with advanced set of features from searching to managing electronic/digital collections. The LSP represent the migration of library systems from client/server architecture on which ILS/LMS are built to the clientless cloud environment. Adegbilero-Iwari (2017) described library service platforms as "web-based, multitenant library systems which operates largely as Software as a Service (SaaS) on the cloud computing architecture for the unified management and discovery of all kinds of library resources." LSPs which have been described as the future of library systems are built upon the advances in architecture which allow for multi-tenant operation, data aggregation, analytics, and redundant and secure data centers in addition to integrated workflow approach which incorporates both print and digital processes and thus ensuring staff efficiency and effectiveness (Grant, 2012). Once called "Unified Resource Management" by Ex Libris, and "Web-Scale Management Service" by OCLC, Marshall Breeding's terminology, Library Services Platform, which he coined in August 2011, has remained the adopted name for these new sets of library systems. He described library services platform as a "type of library resource management system with a set of characteristics that differ substantially from the longstanding genre of integrated library system" (Breeding, 2015).

Breeding defined LSP as a product that "enables libraries to acquire and manage their collections, spanning multiple formats of content, including at a minimum physical materials and electronic content which also support multiple procurement processes, including those related to items purchased for permanent ownership, those made available through paid licenses and

subscriptions, and those selected from open-access sources". As mentioned above, LSP have provided the veritable ground for massive uptake of the cloud computing technology by libraries. Most, if not all, the LSPs are cloud based (Adegbilero-Iwari, 2017). Unlike ILS, there is a short list of players yet in the LSP. The major platforms and their vendors are: BLUEcloud/SirsiDynix, Open Skies/VTLS, Intota/Serial Solutions (fully integrated into ProQuest in January, 2014, Breeding (2015)), Alma/Ex Libris, WorldShare/OCLC, Sierra/Innovative Interfaces and OLE/Kuali (now being developed as FOLIO, McEvoy (2016)) (Grant, 2012; Yang, 2013; Breeding, 2015; Hosburgh, 2016, Adegbilero-Iwari, 2017).

Breeding also broadly classified the features of LSPs as functional and technical. The functional features of LSPs include: management of electronic and print formats of materials, replacement of multiple incumbent products, extensive metadata management, multiple procurement workflows, knowledge bases and bibliographic service, built-in collection analytics, conceptual organization, and discovery services. On the other hand, he itemized the technical features of LSPs to include: beyond client/server computing, multi-tenant platforms, web-based interfaces, services-oriented architecture, APIs exposed for extensibility and interoperability, interoperability and subscription pricing.

Grant, in a NISO's Information Standards Quarterly publication of Fall, 2012, listed and compared features of the available LSPs as follows:

- the Multi-tenancy feature and Cloud computing either as SaaS/Cloud apply to all the LSPs.
- Local installations are possible with Open Skies, Sierra and OLE (FOLIO), unknown for Sierra but not possible for Alma and WorldShare which are fully cloud-based.

- Only Alma and WorldShare were reported to have SAS 70 or ISO 27001 certified data center
- Only Open Skies and Sierra do not support DaaS (shared data service).

Yang (2013) gave summary features of the LSPs as:

- Work with any discovery tool
- Clientless and in the cloud
- Login through a browser
- Unified workflows/Combined library workflows into one interface
- Centrally hosted knowledge base of bib records, database profiles, vendor
- information, publishers' inventories, serials information and more
- Shared data among user/member libraries
- Unified Resources Management (print, electronic, and digital)
- Electronic resources management
    - Link to publishers directly for searching and ordering
    - Order/activate a database and all the journal titles will load automatically into the discovery layer
    - Communicate with publishers directly
    - Link to license
- License management/License manager
- Statistical analysis/assessment/reporting
- Inherent RDA
- User driven acquisition from the discovery layer
- Trial database management

- And many more.

While the list corroborated the compared features of the LSPs by Grant (2012), it has also confirmed some of the features Grant termed "Unknown" or "Planned" for some of the platforms. This also gives room for the fact that some further changes and/or improvements must have taken place across the platforms especially the Open source one (Kuali's OLE). In fact, OLE (Open Library Environment) a project of Kuali who has now be joined by EBSCO and Index Data to develop a new free and open source platform called FOLIO (Future of Libraries is Open) (McEvoy, 2016). In the same vein, Intota of Serial Solutions is now known as ProQuest's Intota following a January 2014 full integration of Serial Solution into ProQuest that acquired it in 2004 (Breeding, 2015). All these point to the renascent nature of the LSP. Despite all these transitional issues, cloud computing and LSP have come to stay in library practices (Adegbilero-Iwari, 2017).

4.4 Cloud Computing, Library Services Platforms and Nigerian Academic Libraries

Now that Library services platforms have been found to be a veritable way for academic libraries to embrace cloud computing it is imperative that Nigerian academic libraries begin to consider this avenue. With long history of participation in library computerization and automation migrating to the LSP arena may not pose significant challenge for Nigerian academic libraries. The question, however, may center around how soon they are ready to move on from the current ILS/LMS in vogue more so, that not all academic libraries can be said to have fully automated their services. The few things that may challenge the adoption of the LSP cum clouding computing are: will and the technology consciousness of library decision makers coupled with the fear of work and man-hour that will be required for migration.

Some factors need be considered, however, before switching to LSP or the cloud. Gallagher (2016) in his paper titled "How to Conduct a Library Services Platform Review and Selection" suggested that librarians should:

a. Review current contract with ILS vendor, general finances, and know one's institution's request for proposal process
b. Survey library users and colleagues
c. Have conversations early on with key people and units such as IT within the institution so as to know which LSP would suit the whole institution's systems
d. Do a market and product research on the LSPs
e. Request price quotes and demos
f. Conduct a cost-benefit analysis on the LSPs in relation to library's current systems

Adegbilero-Iwari (2017) suggested that the following steps can be followed in adopting LSP:

i. libraries set up review teams to begin to assess the various platforms
ii. they can ask for pricing information
iii. they can explore the possibility of a consortium or consortia since LSP are multitenant based and are good for resource discovery and sharing
iv. they can interact with colleagues abroad and get their honest opinions of the platforms they are using
v. they can join the FOLIO community to be involved in its development before eventual release
vi. the Nigerian Library Association can also set up a national level task committee to review this imminent change and trends in the profession

Howbeit, this paper in agreement with the above authors further recommends the following in preparation for LSP adoption in Nigerian libraries:

1. Research LSPs: libraries in Nigeria should set up research teams to study the new trends in the LIS sector around the world and study the emerging LSPs
2. Review existing and new technologies: they should begin to review existing ILS to see if they are really performing less in respect of their users' needs and see if the new LSP can fill the vacuum found.
3. Assessment of library workflow: since one of the major goals of LSP is unified workflow, it is therefore important for Nigerian libraries to reassess their workflows especially at the time both users and regulatory authorities like the National Universities Commission are clamoring for more electronic resources. Discovery service and integration with other library's and university's systems are other gains of the LSP which will also necessitate a wholesome reassessment of library operations going forwards with LSP.
4. Decide on open source or vendor-based: since many libraries in the country use Koha, an open source ILS, it may not be difficult for them to transit to FOLIO when it fully launches in 2018. However, there are established vendor-based LSPs as OCLC's Worldshare Management Services, ProQuest's Intota, Ex Libris's Alma and others. This decision will be influenced by cost, ease of migration from and/or interoperability with existing library systems and support from the vendors.
5. Demand trial/demo especially for the vendor-based LSPs.

5.0 Theoretical Framework

The Diffusion of Innovation Theory

The Diffusion of Innovation theory is relevant to this study since both LSP and cloud computing are new technologies expected to make their ways into the Nigerian library sector. The theory was originally developed by Rogers in 1962. It remains one of the oldest social science theories originated in communication with the purpose of explaining how, over time, an idea or product gains momentum and diffuses through a specific population or social system. The theory holds that acceptance of any technology/information system by users is influenced by such characteristics as compatibility, complexity, trialability, observability and relative advantage of the technology as well as to the intensity of promotion by individuals, known as change agents. The theory was however reviewed in 2003 by Rogers. The theory provides a holistic insight into organisational adoption of innovations (new ideas, concepts, or objects) and is appropriate to understand issues around the adoption of technologies/information system such as LSP and cloud computing.

Under the diffusion of innovation theory, there are five established categories of technology adopters while the majority of the general population tends to fall in the middle categories. The categories are: innovators, early adopters, early majority, late majority and laggards.

Innovators are "venturesome", they are cosmopolitan in outlook, tend to be better educated, willing to take risks, and are more socially mobile than their peers. While the early adopters are already aware of the need to change and so are very comfortable adopting new ideas, early majority usually adopt new ideas before the average person but typically need to see evidence that the innovation works before they are willing to adopt it. The late majority, people that are always skeptical of change, and will only adopt an innovation after it has been tried by the

majority. The laggards are tradition bound people and they are very conservative. They are very skeptical of change and are the hardest group to bring on board.

It is no doubt that Nigerian academic librarians may fall into some of these categories and the attendant impact on LSP and cloud computing adoption can be contemplated.

Conclusion

The reality of the continuous advancements being made in technology is dawning on all professions and especially the field of library science. Although, the uptake of newer technologies like cloud computing is still very low among academic librarians in Nigeria, their attention has been drawn to an important era of modern computing services. The LSP is a certain route to the wider adoption of cloud computing for all categories of libraries across the globe without exempting Nigeria. As shown by the reviews, the LSP is the latest library management system, some steps ahead of the ageing ILS/LMS which for Nigeria and many developing countries is the future of library technology. However, according to the Diffusion of Innovation theory, the possibility of having Nigerian academic librarians spread across the various categories of innovation adopters of innovators, early adopters, early majority, late majority and the laggards with respect to the new LSP is high. Also, there is no doubt, from the reviews, that LSPs could satisfy the five major attributes of an innovation that Rogers identified as compatibility, complexity, trialability, observability and relative advantage which can affect its adoption. Moreover, the role of change agents cannot be overemphasized in seeing LSPs warrant cloud uptake. It is not certain who the change agent might be but Adegbilero-Iwari has suggested what great role the Nigerian Library Association and library decision makers could play. All these will definitely reflect on the response rate to LSP uptake and of course, cloud computing

adoption in Nigeria. But it is hoped the sooner the future which LSP has been thought to represent arrives, the better for the advancement of the LIS profession in this part of the world.

Recommendations

- It is recommended that further empirical study be carried out on librarians' awareness of library service platform
- Preparedness to switch from ILS/LMS can be researched with appropriate technology adoption models.
- Roger's Diffusion of Innovation Theory characteristics as compatibility, complexity, trialability, observability and relative advantage of LSPs and cloud computing can be tested in an empirical study.
- Other aspects of cloud computing adoption in libraries can also be studied.

References

Abidi, F. & Abidi, H. J. (2012). Cloud libraries: A novel application of cloud computing, International *Journal of Cloud Computing and Services Science (IJ-CLOSER)* (1)3: 79-83

Adegbilero-Iwari, I. (2017). Library services platform: Are Nigerian libraries ready for change? [Blog post] Retrieved from https://goo.gl/7VsUid

Breeding, M. (2015). Library services platforms: A maturing genre of products. *Library Technology Reports,* (51)4: 1-41

Chad, K. (2015). Rethinking the library services platform. UKSG E-News, 27th November 2015. Retrieved from http://www.kenchadconsulting.com/wp-content/uploads/2015/11/Rethinking_the-LSP_UKSGeNews_27Nov15.pdf

Chad, K. (2016). Rethinking the library services platform. *Briefing paper*. Retrieved from http://helibtech.com/file/view/Rethinking_the_LSP_Jan2016a.pdf

Dinesh, R., Pravin, S. R., Aravindhan, M. & Rajeswari, M. D. (2015). Library access system smartphone application using android. *International Journal of Computer Science and Mobile Computing*, .4(13): 142-14

Etro, F. (2009).The economic impact of cloud computing on business creation, employment and output in the E.U. *Review of Business and Economics*, (54) 2: 179-208

Fu, P. & Fitzgerald, M. (2013). A comparative analysis of the effect of the integrated library system on staffing models in academic libraries information technology and libraries. Retrieved from https://ejournals.bc.edu/ojs/index.php/ital/article/download/3388/pdf

Gallagher, M (2016). How to conduct a library services platform review and selection., *Computers in Libraries*, (36) 8, 20-22.

Grant , C. (2012). The future of library system: Library services platform. *Information Standards Quality*, (24)4: 1-13

Greenberg, A. (2008, February 19). Cloud computing's stormy side. Forbes Magazine. Retrieved from https://www.forbes.com/2008/02/17/web-application-cloud-tech-intel-cx_ag_0219cloud.html.

Grossman, Robert L. & Gu. Y. (2009). On the varieties of clouds for data intensive computing. *IEEE Computer Society, Bulletin of the Technical Committee on Data Engineering* (32)1: 44-51.

Hinchcliffe, D. (2009). Eight ways that cloud computing will change business. Retrieved from http://.www.majorcrtiics.org/picsdownload.

Hosburgh, N. (2016). Approaching discovery as part of a library service platform. In K. Varnum (Ed.), *Exploring Discovery: The Front Door to your Library's Licensed and Digitized Content*. (pp. 15-25). Chicago, IL: ALA Editions.

Iles, R. & Erturk, E. (2015). Case study on cloud based library software as a service: Evaluating EZproxy. Retrieved from https://arxiv.org/ftp/arxiv/papers/1511/1511.07578.pdf

International Data Corporation, (2008). IT Cloud Services User Survey, pt.2: Top benefits & challenges. Framingham, MA: International Data Corporation (IDC).

International Telecommunications Union, (2012). Cloud computing in Africa: Situation and perspectives. Telecommunications Development Sector. Retrieved from http://www.itu.int/ITU-D/treg/publications/Cloud_Computing_Afrique-e.pdf Jaeger, P. T., Lin, J. & Grimes, J. M. (2012). Cloud computing and information policy: Computing in a policy cloud? *Journal of Information Technology & Politics.*, 5(3):269–283.

Kaushik, A. & Kumar, A. (2013). Application of cloud computing in libraries. International Journal of Information Dissemination and Technology, 3(4), 270-273.

Kroski, E. (2009). Library Cloud Atlas: A Guide to Cloud Computing and Storage | Stacking the Tech. Retrieved from http://www.libraryjournal.com/article/CA6695772.html

Kumar A. D. and Mandal, S. (2013). Development of cloud computing in integrated library management and retrieval system. *International Journal of Library and Information Science*, (5)10: 394-400,

Li, X. (2014). "What Would be the Future of the Integrated Library Systems?." Proceedings of the IATUL Conferences. Paper 3. Retrieved from http://docs.lib.purdue.edu/iatul/2014/libservsys/3

McEvoy, K. (2016). Introducing FOLIO - A new collaboration bringing libraries, service providers and developers together to speed innovation and redefine the future of library automation. Retrieved from https://www.folio.org/files/doc/FOLIO_PressRelease_2016.pdf

Nelson, W. (2012). The future of the integrated library system (Slide). Retrieved from http://www.slideshare.net/tiranloblanc/the-future-of-the-integrated-library-system

Omwansa , T. K., Waema, T. M and Omwenga , B. (2014). Cloud computing in Kenya:a 2013 baseline survey, University of Nairobi School of Computing and Informatics (SCI) & Computing for Development Lab (C4DLab), 1-54

Pace, A. (2009). 21st Century library systems. *Journal of Library Administration*, 49(6), 641-50.

Rogers, E. M. (1983). *Diffusion of innovation*. The Free Press, New York, NY.

Ryan, M. D. (2012). Cloud computing privacy concerns on our doorstep. *Communications of the ACM*, 54(1):36–38.

Ryan, R. M. and Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, (55)1: 68–78.

Subashini, S. and Kavitha V. (2010). A survey on security issues in service delivery models of cloud computing, *Journal of Network and Computer Applications*, (34)1:1– 11.

Susanto, H., Almunawar, M. N. and Kang, C. C. (2012). A review of cloud computing evolution individual and business perspective. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2161693

The U.S National Institute of Standards and Technology (NIST 2011) Department of commerce

United States National Institute of Standards and Technology. (2009). Annual Report on Technology Transfer

Vaquero, L., Rodero-Merino, L. Caceres, J, and Lindner, M. (2009). A break in the clouds: Toward a cloud definition. *ACM SIGCOMM Computer Communication Review*, (39) 50–55.

Yang, S. (2013). Libraries in transition: From integrated library systems to library services platforms. The 14th annual VALE / NJ ACRL / NJLA CUS Users' Conference-Demonstrating Value for Every User. Retrieved from http://www.valenj.org/sites/default/files/B21%20-%20Libraries%20in%20Transition.pdf

Yeboah-Boateng, E. O. and Essandoh, K. A. (2014). Factors influencing the adoption of cloud computing by small and medium enterprises in developing economies, International *Journal of Emerging Science and Engineering (IJESE*), (2)4: 2319–6378