

UNLOCKING THE POTENTIALS OF CLOUD COMPUTING AS A GATEWAY FOR INFORMATION ACCESS AND STORAGE IN LIBRARIES AND INFORMATION CENTRES

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Abstract

The paper examined the perspective of cloud computing as emerging technology and how it affects all sectors of human endeavour, particularly information access and storage in libraries and information centres. It discusses the cloud computing, information access and storage, libraries and information centres, types of cloud computing, cloud computing models, how they are being employed in the provision of library and information services. Also, potentials of cloud computing in libraries and information centres and challenges of deploying them in library and information centres have been highlighted. It concluded that there should be forward looking, risk taking and inspiring library and information centres management and authority readily available and willing to provide the requisite human and material resources and support to facilitate effective potentials of the cloud computing for the systematic advancement of library and information centres operations, resources and services. To a large extent, when such steps are systematically adopted, unlocking the potentials of cloud computing for information access and storage will have a great impact on information resources utilization in libraries and information centres for sustainable development.

Keywords: *Cloud Computing, Information Access, Storage in Libraries, Information Centres,*

Introduction

It is generally believed that every system of any type and for whatever purpose has to undergo and experience some kind of changes and transformation at one time or the other in order to effectively and efficiently respond to anticipated and unexpected changing circumstances and expectations of the time. The way and manner such changes and transformation will occur can be incremental, strategic or systematic to effectively meet the everchanging needs and aspirations of the moment with less or no delay. It therefore becomes expedient and necessary too for library and information professionals to plan for response strategies to desirable or undesirable outcomes. Thus, the adoption of cloud computing vis-à-vis the unlocking of its relevance as a gateway for information access and storage in libraries and

information centres should be seen as one paradigm shift in the way and manner libraries and librarians conduct their information business to accommodate any form of change and transformation. In order to effectively and efficiently strive for excellence and competition in the information market, libraries and information centers must in the wake of technology advancement, be seen to deploy cloud computing and harness its potentials as imperative gateway to information access and storage in the digital age. The library and information service delivery in the 21st century is driven by deployment of new technologies. It is gradually becoming impossible to deliver effective library services without applying technologies, (Kari, 2020). Cloud computing, according to Salam and Ali as cited in Tella, et al, (2020) has the potential to remarkably enhance library staff's productivity and can radically reengineer and regenerate library operations that support the rendering of effective information services

Also, it is paramount to emphasize the need for library managers at all levels to appreciate the invaluable opportunities offered by cloud computing in guaranteeing data security, ease of access, to information, service efficiency, service effectiveness, and above all customer satisfaction. It is against this backdrop that, this paper attempted to unlock the potentials of cloud computing as a gateway for information access and storage in library and information service delivery in the 21st century. Specifically, the objectives of the paper therefore are to:

1. Provide conceptual explanation on the concept of cloud computing, information storage and access, library and information centers
2. Discuss the types of cloud computing cloud computing models
3. Account for the state of library and information centers
4. Highlight the nexus between cloud computing and information storage and access
5. Examine the potentials of cloud computing deployment
6. Highlight the challenges of cloud computing deployment
7. Proffer possible way forward to addressing the challenges

Cloud Computing

Cloud computing is a new phenomenon and has emerged for outsourcing of computing infrastructure, storage of client data and applications that are accessed via a remote server (Hosch, 2009; Knorr & Grumman, 2008). It is a Web-based solution that provides speed and quality information services to customers across the globe. Cloud computing can be seen 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 (Lokesh, Mohamed, Bhupendra, Saurav and Rahul, 2022). It is the practice of using a network of remote servers hosted on the Internet to store, manage and process data rather than a local server or a personal computer (Raza, 2023).

By and large, cloud computing is the provision and enhancement of services through various systems having large data centers and powerful servers that host web applications. This

involves creation, integration and diffusion of resources and services using distributed computers on the Internet. Provisioning and sharing of resources, software, applications and information on public cloud services are made available to the clients. Put simply, cloud computing is the sharing and use of applications and resources of a network environment to get work done without concern about ownership and management of the network's resources and applications. It can further be deduced that cloud computing can be conceived as a technologically based platform or infrastructure consisting of applications, storage media and networks that allow individuals and organizations – including libraries and information centers - to have unhindered access to and share data, information and knowledge to their respective customers/users.

Interestingly, many individuals and organizations including libraries and information centers are adopting cloud computing technology model to ensure quick access to information services. Khozani et al (2021) assert that libraries and information centers are seen as the organizations that can hugely benefit from this technology. Currently, a large portion of the operations and services provided by libraries are based on information technologies such as information networks and the Internet. Additionally, they are saved from hosting and operating multiple servers over their own network. It saves them from the burden and risk of constantly hardware failure, power failure and fluctuations, no need not to worry of installing the software, upgrading or backup issues and above all, it saves the cost to the organization, (Kumari, 2022)

Information Access and Storage

Information access refers to the means or modes through which information is made available, or to an entire range of possibilities for making information and information services available to the users. It is the right to use information available in print, non-print/electronic, or micro format resources, (Keralapura, 2003). It is the increase and provision of information resources to customers in order to increase their knowledge base (Nwachukwu, Abdulsalami and Polina, 2014). Thus, the increase in use of information resources and its importance raises concern as to whether these resources are fully accessible to all users. The central significance of access to all recorded knowledge and experience is underlined by the absence of any restriction of guidance as the nature of the contents of the library and information centres. The framework of information makes two values of assumption to the function of a library and the right accessibility to it or not. Library resources provide information on the user groups that benefit from information accessibility.

On the other hand, information storage according to Kenneth (2021) is the use of collective methods, tools and/or technologies that capture and retain information. These methods, tools or technologies can be traditional or contemporary information storage approach. Traditional information storage is fully centered on the use physical information storage objects or facilities such as shelves, archival boxes, file folders file cabinets etc. However, as the world of information evolved due to rapid advancement in disruptive technologies, contemporary tools and methods such as databases, hard discs, CDs, DVDs, and cloud were introduced and adopted for the storage of digital information and knowledge for access and use of users in libraries and information centers.

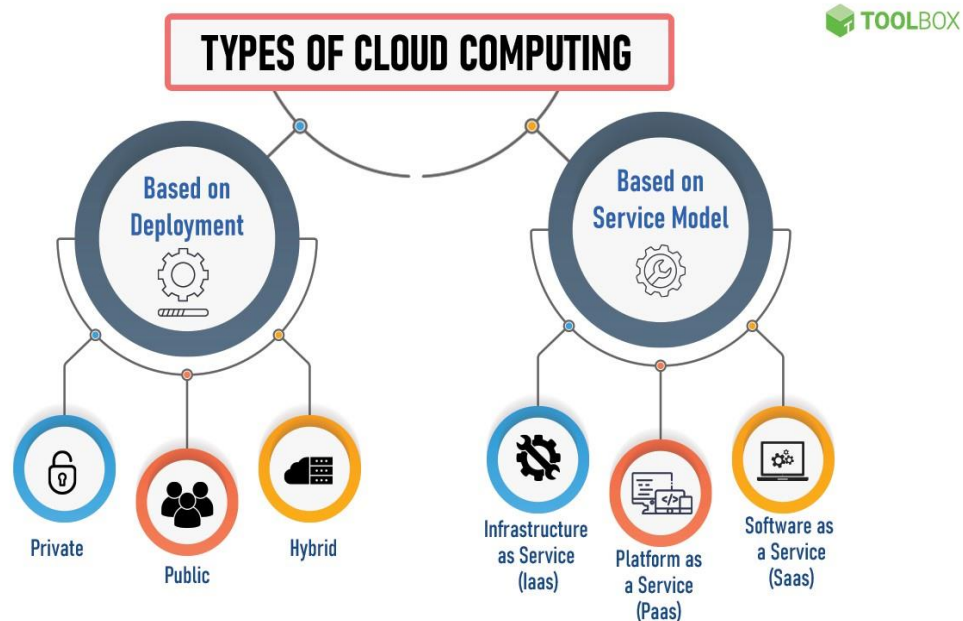
Libraries and Information Centres

The basic mission and objectives of libraries and information centres regardless of type and the operating environment should be to support and promote natural and social justice, equity, fair play and democratisation of information access and utilisation. Mohammed (2017) argued that library and information centres service agenda should make provision for freedom to seek, identify, retrieve, receives, access, impart and utilise information and ideas of all kind and quantum on the equal basis by all categories of customers, regardless of their physical and psychological features and challenges, for their information, enjoyment, education, research, entertainment etc. through varied communication media most suitable to them and of their choice. This implies that, weather the customers are physically able, disable or differently able, there should be no discrimination in service provision to satisfy their needs. According to Ranganathan, libraries and information centres “are growing organisms, they must therefore constantly change in order to deliver value added information services for sustainable development” (Umar, 2018). He added that today’s libraries and information centres are characterized by innovations and creativity driven by research, information and communication technologies acceptance and applications.

In a nutshell, the above conceptions clearly portray library and information centre as a valuable pathway for achieving sustainable by creating an “enabling platform well equipped with high quality information resources, services, facilities, system and competent personnel where individual citizens could have unhindered access to and use information and knowledge” (Ezekiel, Mohammed and Maimuna, 2022). In effect, Library and information centres remain strategic platform for reading, research and relaxations in safe and serene environment, individual study and consultation; formal and informal peer group study, meeting and socialization, academic and non-academic support services such as teaching, learning and research, and finding solution to touring exhibition and displays; films and slide shows; debate and discourse; social, cultural and political networking and integration, (Mohammed, 2017). This perspective is a pointer to the fact that it is expedient and compulsory for library managers to deploy cloud computing and unlock its potentials as a gateway for information access and storage in their libraries and information centres.

Types of Cloud Computing

There are different types and classifications of cloud computing. it can either be classified based on the deployment model or the type of service. According to the specific deployment model, cloud computing can be classified into public, private, and hybrid cloud, (Parlinska and Iryna, 2017). Also, at the same time it can be classified as Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS) based on the service the cloud model offers, (Patil & BasuMallick, 2022). The figure below depicts the various typologies and classification of cloud computing.



Adapted from Patil & BasuMallick (2022)

Types of Cloud Computing based on Deployment

Under this section, private, public and hybrid types of clouds will be briefly explained as follows:

Private Cloud

Private cloud which is opposite to the public cloud, is the type of cloud which works in one organisation with many users and it gives the possibility to build the cloud by taking into consideration all organisations preferences and needs. Lokesh, Mohamed, Bhupendra, Saurav and Rahul, (2022) and Akhour and Javed (2022) argued that in private cloud model, the cloud infrastructure is owned by a single entity for the personal application and it is only accessible to the owner or related person, under the direct control of the owner as well as the services provided is for to the owner. It is also termed internal, enterprise, or corporate cloud. Patil & BasuMallick (2022) stated that a private cloud is usually managed via internal resources and is not accessible to anyone outside the organization. They further buttressed that a private cloud provides a higher level of security through company firewalls and internal hosting to ensure that an organization's sensitive data is not accessible to third-party providers.

Public Cloud

The public cloud is located outside the entity of the user of cloud. This implies that, the user has limited access to cloud infrastructure and working in this cloud does not require the special equipment apart from Internet access. Public cloud refers to computing services offered by third-party providers over the internet and it is available to anyone who wants to use or purchase them, (Patil & BasuMallick, 2022). These services could be free or sold on-demand, where users only have to pay per usage for the CPU cycles, storage, or bandwidth they consume.

For instance, libraries and information centers could decide to pay or get free cloud services for their data, information resources and knowledge. In effect, it is convenient for libraries that are looking for fast and cheap access to data and offer scalable RAM and flexible bandwidth, making it easier for businesses to scale their storage needs.

Hybrid Cloud

This is a combination of private and public cloud features and capabilities. It is seen as “the best of all models which allows a shift of workloads between private and public clouds as the computing and cost requirements change” (Patil & BasuMallick, 2022). In a hybrid cloud model, companies and organisations can only pay for the resources they use temporarily instead of purchasing and maintaining resources that may not be used for an extended period. In essence, a hybrid cloud offers the benefits of a public cloud without its security risks.

Based on the service model, cloud can be classified into Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS). Let us take a look at each one as follows:

Infrastructure-as-a-Service (IaaS)

Infrastructure as a service or (IaaS) is a type of cloud computing in which a service provider is responsible for providing servers, storage, and networking over a virtual interface. In this service, the user does not need to manage cloud infrastructure but has control over the storage, operating systems, and deployed applications, (Patil & BasuMallick, 2022). In addition, user does not buy separately software, servers, network equipment or data-center space; rather users buy it as fully outsourced service. Example of such include: Amazons web services.

Platform-as-a-Service (PaaS)

The Platform as a Service (PaaS) is a category of service which provides platform or environment to allow the developers to build the required applications or software to allow user have access simply via a web browser over the Internet. The software could be deployed and configuration settings are done by users. All types of libraries and information centers, irrespective of its size, can adopt this service as it is very hassle free, less worry about the maintenance of hardware of software infrastructure. It also offers free solutions such as Google Apps for information, a free online suite of tools that include Gmail and yahoomail for electronic mail, Google Docs for documents, spreadsheets and presentations; and Microsoft’s cloud service like SkyDrive. In this type of service, a user purchases the resources from a vendor on a pay-as-you-go basis and can access them over a secure connection.

Software-as-a-Service (SaaS)

The Software as a Service or SaaS is a service in which software or applications are provided to the users as a service. This program can be accessed online via any suitable client such as a web browser. In this model, the users are provided access to the applications through licenses or subscriptions. Example of such services include: Google Apps, Salesforce, Hotmail, Skype, Web 2.0 solutions such as Facebook, Twitter and Flickr. Software as a Service is useful

in libraries and information centers because it has less worry about hosting, installation, upgrading, or maintaining the software or applications. In addition, the user has low initial costs and access is usually 24/7 support services. Also, under this service model, the service provider manages all the hardware, middleware, application software, and security.

Contrastingly, Raza (2023) further identified other types of cloud service models such as Container as a Service (CaaS), Monitoring as a Service (MaaS), Anything/Everything as a Service (XaaS) and Function as a Service (FaaS) respectively.

The Current State of Affairs

It is a fact that libraries and information centers in Nigeria have to some extent deployed information and communication technologies in order to enhance their services to their user communities. Ogwo et al, (2022) observed that academic libraries in most developing countries and Nigeria in particular are gradually digitizing their contents, operations and services using computers, Integrated Library Management Software (ILMS), servers, website etc. Today, information resources are not only acquired in print but in digital format; information resources that are in print are equally been retrospectively converted into digital resources and are stored in networked environment on either offline or online databases. Similarly, many libraries have developed institutional digital repositories in order facilitate access to and retrieval of information and knowledge with either onsite physical servers or remotely cloud servers. Ango (2022) stated that many libraries have started integrating themselves with information and communication technologies on content delivery, communication and collaboration by adopting cloud computing.

Regrettably, it can be rightly argued that, the potentials of cloud computing as a gateway for information access and storage have not been fully harnessed by libraries and information centres in Nigeria. A look at more recent research shows that cloud computing is a common and trivial subject in developed countries; however, it still poses challenges for libraries in developing countries, (Khozani et al, 2021). Some of these challenges might include the management and maintenance of the technological infrastructures due to paucity of funds, poor skills among librarians and their attitude towards technology deployment in libraries and information centers. It is therefore imperative to demand a radical progressive attitudinal change from library and information professionals to “expand their knowledge and skills in the field of cloud computing and take a step to promote the adoption of this technology” (Khozani et al, 2021).

The Nexus Between Cloud Computing and Information Access and Storage

It is generally accepted that cloud computing technologies and libraries and information services are intricately intertwined especially with respect to information access and storage. Thus, cloud computing offers library and information centres the opportunity to provide effective and efficient information services to their diverse user communities. In this regard, the cloud service provider handles and supports all services including issues of installation, licensing,

upgrading and maintenance of the systems. Additionally, cloud computing organizations provide infrastructure, networks, servers, applications, platforms and related services for information access and storage. Thus, this allows libraries and information centres to maximize the services to access and store the needed information (Mohammed, 2018).

Essentially, libraries and information centres are created to guarantee unhindered access to information and knowledge with maximum ease and speed. On the other hand, cloud computing as a platform is considered as a veritable solution complementing the traditional tools and apparatus used in information access and storage. It is therefore right to conceive the notion that the deployment of cloud computing as a gateway for information access and storage is a necessary pathway, which library and information centers must follow if they want to survive, grow and remain relevant and competitive in the information business environment. Certainly, cloud computing serves as an enabler for efficient and effective 24/7 access to and storage of information. In essence, the synergy between cloud computing and information access and storage in libraries and information centres is very vital and librarians have a responsibility to work out modalities to maintain and sustain the relationships by continued deployment of information and communication technologies for ease of library operations.

Potentials of Cloud Computing in Libraries and Information Centres

The extent to which the potential of cloud computing can be unlocked and subsequently harnessed by libraries and information centres for information access and storage is directly dependent upon the types/categories, models and service, securities, network infrastructures deployed by them. Makori (2016) argued that the information environment is characterized by the information explosion which has forced libraries and information centers to look at effective methods of providing quality services to their clients. This implies that modern technological trends brought by personal computing and networking are compelling libraries and information centers to create online communities through globalisation of information services, unlimited access to information and communication services, mass provision of information services, economics of information and open source systems.

Cloud computing therefore is the emerging new landscape of handling and supporting information services that takes advantage of numerous open source applications, modules and components. Varghese and Buyya (2017) argued that in the twenty-first century, many internet-based organizations, vendors and institutions are involved in various activities or initiatives meant to promote cloud computing model in libraries and information centers. For instance, Yahoo, Google and IBM are engaged in funding universities whose purpose is to promote research in cloud computing projects. These companies provide hardware, software and services to augment university curricula and expand research horizons for the academy using the cloud computing model. Thus, university libraries must change the traditional practices of handling and managing information services and address all the informational and technological needs of the clients where the emphasis is on the quality delivery of services.

Weinman, (2012) outlined the following points as the economic potentials of the use of cloud computing:

- (a) common infrastructure which gives possibility to decrease the money spent on Information Technology equipment (for example: no need to have own server.
- (b) Cloud computing has online accessibility, the user needs only the Internet access and cloud does not exist without network.
- (c) Cloud computing has location independence and users can access the cloud services at any location they are.
- (d) Cloud computing has utility pricing where users of the cloud pay only for the service they currently use (pay-per-use pricing).
- (e) Cloud computing has on-demand resources which gives possibility for users to allocate the right quantity of resources at the right time. This implies that the users get all information they need based on their current real time demand.

Other potentials of cloud computing as a gateway for information access and storage could be summarize as follows:

- ❖ Provision of timely and unhindered access to information and knowledge;
- ❖ Guaranteeing effective information/data storage;
- ❖ Facilitate collection development functions and processes in library and information centres;
- ❖ Facilitation of information retrieval processes;
- ❖ Ensures maximum information/data integrity and security;
- ❖ Reduction in the cost of technological infrastructure deployment and systems maintenance;
- ❖ Promotion of research and e-learning experiences; and
- ❖ Building collaboration, partnership and alliances for resource sharing.

Challenges of Deploying Cloud Computing in Libraries and Information Centres

It is a fact that technology, especially cloud computing, is fast evolving at a quantum leap. Like in other sectors of human endeavour, cloud computing is transforming the way and manner information access and storage are carried out in terms of the processes, facilities used, devices and manpower requirements. Generally, accepting, adopting, deploying, and sustaining cloud computing successfully in libraries and information centres, will create a better information service environment and experiences devoid of user apathy and frustrations. However, deploying cloud computing in libraries and information centres operations, resources and services cannot be without some obvious challenges. Lokesh, Mohammed, Bhupendra, Saurav and Rahul, (2022) highlighted that cloud computing is prone to security lapses which could end up compromising the delivery of services. Also, according to Usman (2021) Internet speed, privacy and system breakdown are some of the challenges of deploying cloud computing.

Regrettably, Once the system breakdown and security risks occur, the consequences are potentially harmful to many libraries and information centres. In addition, outsourced data and resources are never safe. It has data privacy, legislation and security concerns challenges. This implies that libraries and information centres with serious concerns about data security should build their own private cloud services to keep costs down. Also, Bandwidth issues also tend to affect the success of cloud computing infrastructures, as some organizations may capitalize on the use of bandwidth and end up over-charging clients. Many cloud companies sell bandwidth services based on “average” or peak usage instead of maximum usage.

In similar mode, some other challenges to deploying cloud computing in libraries and information centres include but are not limited to:

- ❖ Data privacy and security risks
- ❖ Networking infrastructure
- ❖ Bandwidth adequacy and effectiveness
- ❖ Initial cost of deployment of cloud computing
- ❖ Skilled manpower in libraries and information centres.

Conclusion

There is no doubt that cloud computing is a gate way to information access and storage in libraries and information services and could bring to a large extent good transformations, innovations and create a new vista in the way and manner library services are rendered to customers in the 21st century. It also has the capacity and opportunities to change the status quo of the libraries and information services for the good of national development and sustainable future. Additionally, cloud computing can passionately inspire the vision, mission, goals and aspirations of libraries and information centres towards fostering cooperation, build spirited teams, create standards of excellence and guarantee effective and efficient information service delivery. It is therefore hope that that, the paradigm shift should be embraced by librarians and information centre managers in order to unlock and harnesses the numerous potentials of cloud computing as a gateway for information access and storage in our libraries and information centres.

The way forward

In the light of the foregoings, it is suggested that,

- ❖ the management of library and information centres should take critical decision on the types and model of cloud computing to deploy or adopt in the best interest of their teaming customers;
- ❖ library/information managers should prioritize building the essential technical know-how and computer proficiency especially among the staff and possibly the customers through organized seminars, in-service trainings, conferences and workshops;
- ❖ libraries and information centres should as a matter of policy deploy and implement the most affordable and reliable cloud software model and services for the overall

development and advancement of the library and information services to their user communities;

- ❖ libraries and information centres need dedicated corps of personnel who are innovation oriented; think differently from the “norms”; strategically engage in team work; and effectively communicate and respond to anticipated and impromptu changes and transformation as the profession demands.
- ❖ Above all, there should be forward looking, risk taking and inspiring library and information centres management and authority who are readily available and willing to provide the requisite human and material resources and support to facilitate speedy unlocking and harnessing of the potentials of the cloud computing in our libraries and information centres operations, resources and services.

References

- Akhour, V. & Javed, W. (2022). A Comparative Study of Cloud Deployment Model. *International Journal of Creative Research Thought (IJCRT)* 10(5), 856-863. <https://ijcrt.org/papers/IJCRT2205435.pdf>
- Ango, J. R. (2022). A study of awareness and utilization of cloud computing for information storage and retrieval in selected academic libraries in south west universities in Nigeria. *International Journal of Advances in Engineering and Management (IJAEM)* Volume 4, Issue 8 Aug. 2022, pp: 912-920 www.ijaem.net
- Dutt, M (2015). Cloud Computing And Its Application In Libraries. *International Journal of Librarianship and Administration*. 6(1), 19-31. <http://www.ripublication.com>
- Ezekiel P., Mohammed Z., and Maimuna I. (2022). “Adoption of Tripartite Research Collaboration among Universities, Industries and Government Agencies and their Libraries and Information Centres in Abuja Environs, Nigeria.” *Journal of Nigerian Library Association Adamawa State (JNLAAS)*, 1(2), 1-18.
- Hosch, W. L. (2009). Google inc. Encyclopedia Britannica Online. <http://search.eb.com/>
- Kari, H. K. (2020). Digital transformation of information and its impact on libraries. *World Journal of Innovative Research (WJIR)* Vol. 9(1) July, 2020. www.wjir.org
- Kenneth, K. (2021). Information Storage and Retrieval in Developing Countries Challenges and Possible Solutions. 1-15. DOI: 10.13140/RG.2.2.12062.46401
- Keralapura, M. (2003). Information Access in Libraries. *Annals of Library and Information Studies*. 50(2), 85-90. https://www.academia.edu/2846150/Information_access_in_libraries
- Khozani, M. L., Behzadi, H., Nowkarizi, M. & Neizar, F.S. (2021). We live in Cloud Computing World, without using it in our libraries. *Library Hi Tech*. www.emerald.com/insight/0737-8831.htm

- Knoor, E., & Grumman, G. (2008). What Cloud Computing really means. *InfoWorld*. Vol. 7. P. 20
- Lokesh, A., Mohamed, S., Bhupendra, K. S., Saurav, K & Rahul, S. (2022). Cloud Computing: the Emerging Technology. *International Research Journal of Modernization in Engineering Technology and Science*. 04(10), 1503-1510. www.irjmets.com
- Makori, E. O. (2016). Exploration of cloud computing practices in university libraries in Kenya. *Library Hi Tech News*, 33 (9) 16-22, doi 10.1108/lhtn-11-2015-0077
- Mohammed, Z. (2017). Towards Exploiting The Dynamics Of Information To Cope With The Present And Catch Up With The Future An Inaugural Lecture presented at The Assembly Hall, Ahmadu Bello University, Zaria, 18th October, 2017. Series No. 03/17
- Mohammed, Z. (2018). Exploiting the potentials of Disruptive Technology and Disruptive Innovation in Library and Information Services. *Nigerian Libraries: Journal of Nigerian Library Association*. 51(2). 26-40
- Nwachukwu, V. N., Abdulsalami, T. L. & Polina, F.M. (2014). Availability, Accessibility and Use of Information Resources and Services among Information Seekers of Lafia Public Library in Nasarawa State. *Information and Knowledge Management*. 4(10), 1-11. <https://core.ac.uk/download/pdf/234671811.pdf>
- Ogwo U., Ibegbulem, F. & Ezema, I. J. (2022). Prospects and Challenges of Cloud Computing for Effective Information Service Delivery in Academic Libraries in Nigeria. *Trends in Academic Library management in honour of Prof. Benson Eziukwu*. DeRafelo Publishers, pp391-413
- Patil, P. & BasuMallick, C. (2022). What is Cloud Computing? Definition, benefits, Types and Trends. <http://www.spiceworks.com/tech/cloud/articles/what-is-cloud-computing/amp/>
- Parlinska, P. & Iryna, P. (2017). Cloud Computing and its Benefits. *Information Systems in Management*, 6 (4) 309–317. DOI: 10.22630/ISIM.2017.6.4.5
- Patel, H. B. & Nirali, K. (2021). Cloud Computing Deployment Models: A Comparative Study. *International Journal of Innovative Research in Computer Science & Technology (IJIRCST)* 9 (2), 45-50. <https://doi.org/10.21276/ijircst.2021.9.2.8>
- Raza, H. (2023). Cloud Service Models. <https://www.slideshare.net/HasanRaza331074/cloud-service-modelspdf>
- Tella, A., Ukwoma, S. C. & Kayode, A. I. (2020). A two models modification for determining cloud computing adoption for web-based services in academic libraries in Nigeria. *The Journal of Academic Librarianship* Vol. 46(6) (2020) pp.102. www.elsevier.com/locate/acadlib
- Umar, L. (2018). Role of Libraries and Librarians in the Promotion and Realization of the Goals of "Change Begins with Me" Campaign in Nigeria. *Nigerian Libraries. Journal of the Nigerian Library Association* 51(1): 101-110

- Usman, H. (2021). Cloud Database: A Key to Library Networking and Information Access for Sustainable development in Contemporary Digital Era. *Conference of Nigerian Library Association, Kaduna State Chapter. Library Proceedings of 2021*. 209-215
- Varghese, B., & Buyya, R. (2017). Next generation cloud computing: New trends and research directions. *Future Generation Computing Systems*, 79 (3), 849-861. <https://doi.org/10.1016/j.future.2017.09.020>
- Weinman, P. (2012) *Clouconomics: the Business Value of Cloud Computing*, Hoboken, New Jersey, USA
- Ogwo U., Ibegbulem, F. & Ezema, I. J. (2022). Prospects and Challenges of Cloud Computing for Effective Information Service Delivery in Academic Libraries in Nigeria. *Trends in Academic Library management in honour of Prof. Benson Eziukwu*. DeRafelo Publishers, pp391-413