

Digitizing Library Collection and Cloud Computing Service in Library Space

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Abstract- With the information explosion keeping track of digital movement, has brought a dramatic change in every field, as information technology contributes positively to libraries and information services. Most information collections and storage areas used virtual environments and now moving to cloud computing services, by converting their analogue information materials to digital. (1) This paper highlighted stages and methods in creating, storing, managing and handling digital information materials, emphasizing the tools and techniques in digitization work. (2) The objectives of this study were on methods and methodology involved in the digitization of library resources and the use of cloud computing services in libraries space. Literature review research was adopted for the study. (3) The paper outlined the basic concept of how to digitize library collections and use cloud computing services in digital libraries under the following subheadings: Digitization processes in the libraries space, Cloud computing services in libraries space, Digitization and cloud computing services in the libraries and advantages, limitation and recommendation.

Index Terms- Library Space 1; Digitizing Library Collection 2; Cloud Computing Services and Library on the Web 3

I. INTRODUCTION

The advancement of technological innovations in institutional learning is broad and burdensome. While the impact of the new innovational technologies is unlimited, it's a challenge for most libraries to keep in step with the speed of growth of these technologies, even as today's technology innovations experts discuss A.I. (artificial intelligence) and immersive virtual trends but still, some institutional libraries are still trying to meet up with how best to leverage in digitizing their collection and move to cloud. The cloud technology services are (I.T) Information Technology base services, advancement of client computers and online web (Dillon *et al*,

2010), cloud computing provides enabling services to store handle and manage digitized library collections. Digitization is a process of converting analogue information format to the computerized representation of the analogue text. Text and image are part of the media to digitize with different methods on how to digitize them, the stages in digitization include converting analogue information materials into their corresponding computerized values 1s and 0s, the fundamental processes or stages of digitization involve scanning, that is image capture, where hardware and software selections are done, set or provided by the library of the parent institution.

The phrases digitization, cloud computing services and libraries space are all terms that refer to different types of services coming together and becoming increasingly popular in today's library and information society. These services allow users to access and retrieve digital information and knowledge resources for a different reasons. In this regard, the libraries and information Centres need to implement a wide variety of cutting-edge technology to improve the quality stand of service delivery, (Adarsh L. Mandalwar, 2023). With digitized collection and cloud computing services, the library can go a long way in providing effective services considering the numerous advantages of digitised data and cloud computing services in the present age, where digital information material and access are given much priority.

The objectives of this paper focused on the digitization method and use of cloud computing services in the libraries.

II. LITERATURE REVIEW

The literature on digitizing library collection and cloud computing role in promoting and providing access to library information resources is expanding, with researchers increasingly acknowledging the need for local content relevant and ethically aligned technologies. Studies highlight the importance of digitizing library collection and cloud computing service in providing access to local content, knowledge in the library. Venkatesh S K and Manjunatha K.S. (2016) study, "Rising trend of digitization in Libraries" the study reveals that digitization is an important task in 21st-century libraries. It's getting more and more important in the present era of technological advancement. The new libraries have the advantage of the latest technology, and the goodwill of the established libraries will allow their present in the online world. Nilratan and Sriparna (2015) studied "Cloud computing and its applications in libraries". The objective of the study was on how cloud computing can help free in libraries from managing technology so that they can focus on collection building and improve services with innovation. Cloud computing encourages libraries and their users to participate in networks and community of libraries by enabling them to reuse information and socialize around information. The finding of the study revealed that cloud computing transforms the way systems are built and services are delivered, providing libraries with an opportunity to extend their impact. It also revealed that cloud computing is beneficial as it is flexible, scalable, elastic, pay per usage, economy of scale, cost-effective and has no maintenance fee, for hardware and software. However, literature specifically addressing digitization of library collection and cloud computing service role in information access in library space remains limited, pointing to a gap in understanding digitization and cloud service potential and pitfalls in this unique context.

III. METHODOLOGY

The research methodology adopted for the studied was literature review research. Literature review research methodology can broadly be described as a more or less systematic way of collecting, synthesizing previous research and identifying knowledge gaps within the literature (Tranfield *et al*,

2003). This studied adopted structured approach to reviewed relevant literatures, ensuring a broad yet focused examination of digitization of library collection and cloud computing services in the library space. Unlike previous studies only focuses on either digitization of library collection and challenge or cloud computing and its security challenges. The materials used for the research were sourced from articles in journals, internet and textbooks among others. The content analysis approach examines the qualitative data such as words, images, and concepts more thoroughly. Examine digitization of library collection and use of cloud computing in the library, discussed the method of digitizing library collection process and important of cloud computing use in the library, providing insights into contextual adaptation and strategic alignment.

IV. DIGITIZATION PROCESSES IN LIBRARY SPACE

The first stage in digitization is the scanning of analogue document format or image, to obtain an electronic version of the document or text, to complete the process, there is a need for digital text creators comprised of software and hardware gadget. It's somehow a challenging task to confront in terms of selecting or choosing the right brand or company, for what gadget, as is subject to change with innovations in technological advancement. The actor's line "image" is true because, the scanner creates the electronic or digital version of the original analogue information material to digital, whether that item is a text or image. The computerized text or image created by the system is stored in numeric form 0s and 1s. That is, when the document is converted to view on a monitor, the analogue format continuous tone text or page is divided into dots which give assigned values 0s and 1s together against a grid, the form of the dots is remembered and arranged by the system with appropriate function in a computer (Chaurasia, N K. 2006). However, the system used by archival and digital form creators may contain tools needed for digitization, figure 1 shows example below.



Figure 1 Book-eye 4 scanner

i. (DH) Digitization hardware (scanner)

There are several hardware for image creation, which is used within groups, communities, organizations or institutions, the gadget ranges from scanners (sheet fed, drum, slide, flatbed, microfilm and book-eye) to high-resolution electronic or digital cameras and computers. The results will be satisfactory, the project manager select the most available way or one that is affordable on available funds.

ii (DS) Digitization software

Digitization, software recommendations is a task, because it varies based on the digitization project to be carried out, as with hardware, the choice from one project to another considering parent institution or an organization recommendations and available funds. However, many tools are often used in most analogue information format conversion projects, regardless of any product or software gadget selected, the work needs analogue scanning application software.

The focus of any text scanning software is how well it functions with regard text to being scanned, among optical character recognition (OCR) or image capture (IC). The OCR convert to text or document, Morrison, et al (2018)

iii Image type

Images are in four types: a bit black and white, eight (8) bit greyscale, eight (8) bit colour and twenty-four (24) bit colour, a bit is a segment form of a computerized system, with a bit represented by either 0s or 1s. 0s are considered an absence and 1s are presence with more challenge and complex digital data representations being followed by so many combined bits unit (Robinson P. 1993), 1s bit black and white of digitised text or page means a bit can either be black or white and eight (8) bit greyscale

images are upgraded from 1s bit as they forms 256 shades of grey. (<http://www.hcu.ox.ac.uk/jtap/>).

iv File types

The three main filing systems mostly used for scanning documents are JPEG, GIF and TIFF, because they can transfer data to most of the medium platform software or web pages. (TIFF) tagged image file format are used format for recording image text or OCR creators and storage as master copy and (JPEG) joint photographic expert group files format are used for web or online viewing and data transfer through universal resource locators or pages that have space restrictions.

Considering the complex work of digitizing library collections it is of paramount importance, to know how and where to save or store the library collections, for enhancement of effective service delivery. There are many facilities and storage devices used for information or digitised collections storage, such as magnetic disks, hard disks (internal and external hard disks), memory cards, ZIP drives, computer servers, centres and cloud computing services (storage)

V. CLOUD COMPUTING SERVICES IN LIBRARY SPACE

Mavodza (2013), communities, organizations or institutional libraries and information centres are using cloud services for organizing and storing their library collections or information resources, by the use of (SaaS) software as a service in libraries for library catalogues, Google, aggregated subject gateways and WorldCat, while the web (PaaS) platform as a service using Google AppEngine, or (IaaS) infrastructure as a service for green stone, D-Space or FEDORA, in cloud computing service which confirmed as a medium, channel or platform in storing, accessing or retrieval of information resources for better, effective and efficient library services. Example in the figure below



Figure 2

i. (SaaS) software as a service of cloud computing service

(SaaS) allow users to take full advantage of the software as a service for storage, access and retrieval of information with cloud services, it's open for users with less cost to install or run the software. The cloud customers are not to manage the infrastructures on which the cloud is running. The model provides web or online applications services, open services, unlimited remote access, storage and retrieval with any device in a computing system connected to the internet, The applications are released for use, and consumers do not have control over the services which employ a multi-tenancy systems architecture, applications are organized into single logical environment on the software as a service (SaaS) to achieve economic of scale and optimizations in terms of speed, security, availability, disaster recovery, and maintenance (Dillon, *et al*, 2010). Example in figure 3



Figure 3

ii (PaaS) platform as a services

The (PaaS) platform as a service enables the institution to generate, and run the software application and other tools online with less cost of managing the application at the end of the clientele base, the platform offers programming languages and software development tools that customers can use to

develop their applications or platforms that host both completed and in-progress applications (Dillon, *et al*, 2010). The major prominent providers of platform as a service: GoGrid, Aptana, Amazon Elastic Cloud and EMC Atmos, are examples of (PaaS) services which provide or generate software applications for users with support and maintenance of the information technology facilities with less cost.



Figure 4

iii (IaaS) infrastructure as a service

The (IaaS) service comprises a broad range of functions and information materials with support to create a virtual environment on the cloud. Institutions can develop entire platforms on demand for storage, and collaboration of resources, the subscriber communities, organizations or institutions can have access to services via virtual systems through the internet. IaaS have many benefits for libraries, with the potential of making workloads faster, easier, more flexible and less costly with cloud computing deployment models.

Below are some cloud computing models that can be deployed in institutional libraries to store and manage digitised collections



Figure 5

iv (PCC) Public cloud computing.

(PCC) is the conventional feeling of cloud services with this an institution or a subscriber works remotely or freely. The brand and information are completely on the cloud infrastructure of the outer

layer of vendors for all users approach, given a priority. The public cloud model allows systems and services accessible to the public, it's an off-premising system from which the services are provided, with no physical control of infrastructure by the users. The cloud customer uses an infrastructure pool from which any group, community, organization or institution that needs the services share the same infrastructure to run their services. It can be accessed from any location with internet connectivity.

increases the flexibility of digital services in the institutional libraries.



Figure 6

v. (PCC) Private cloud computing

The (PC) is a services or system that allow accessibility to a person or an institution such as offline content. The operation is for a single entity or institution and deployment is in closed environments, maintenance and operation (Kenneth, et al., 2018). The service provides much security as it is used within the internal firewall framework system. Example of hybrid cloud in figure below

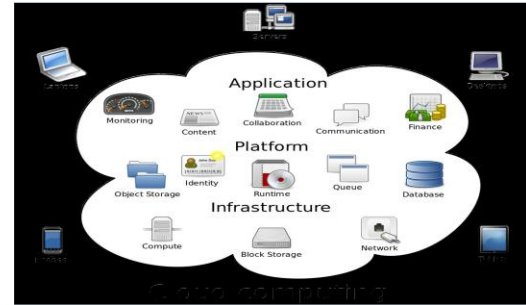


Figure 8

Electronic library service on cloud computing

VI. DIGITIZE COLLECTION AND CLOUD COMPUTING SERVICES IN THE LIBRARIES

With the advancement in technological innovation and information explosion, libraries are facing many challenges in managing their digital resources, given the above prompt libraries migration from the traditional library, client-server to cloud computing technology services. The digitized or electronic collection of libraries space such as digitize books, journals and any other digitize files are uploaded to cloud storage for safe easy and constant access, cloud technology services are used by advanced libraries to scale their assets and give the best in effective service delivery, the service is a web-based system, capable of providing access to storage and collaboration within the user's community, groups or institutions, (Adebilero, 2017).



Figure 7

(HCC) Hybrid cloud computing

(HCC) encompassed public and private cloud computing services which give access through their platform to move digital data, and applications from one interface to another. The model uses a standard format regardless of the customer or user location. The hybrid model uses third-party providers in full or part, depending on demand which creates or

Library technological services are computerised services, multitenant services which operate largely as software as a service (SaaS) on the cloud computing technology for collaboration and management of the digitize collections, thus ensuring libraries' efficiency and effectiveness in service delivery (Grant, 2012). Below is an example of library space on cloud.

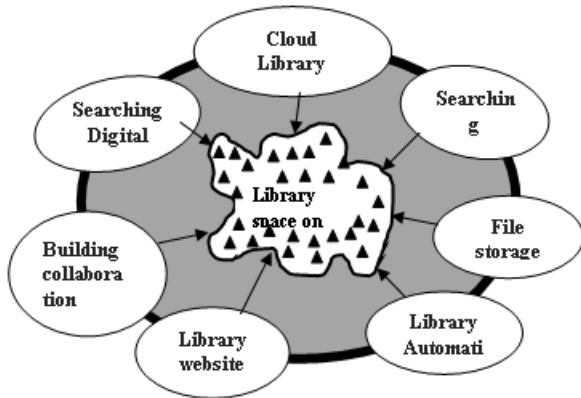


Figure 9

VII. LIBRARY SPACE ON CLOUD STORAGE

The cloud storage medium is comparative, the medium is online and uses the space on the cloud to stores data, media and files and also allows access and retrieval of such digitize information when needed. One of the advantage of cloud storage is that it has no physical data storage areas, the storage is with the cloud, where store data or files can be overseen from any location, as long as clients associate with cloud storage. For example below IBM provide cloud service



Figure 10

IBM Cloud

IBM Cloud offered business cloud services to organisation, such services include: software as a service (SaaS), platform as a service (PaaS) and infrastructure as a service (IaaS) through private, public or mixed cloud service delivery, and also offers services such as hardware platforms for distributed computing help for virtualization and collaborations between groups of institutions or communities.



Figure 11

Web accessing application in library space

Web accessing services are units of distributed computing services with an internet browser that provides the user interface through a universal resource locator (URL), where the browser user and the server exchange protocol messages painted as HTTP requests and responses. The quantity of content offered via URLs on the browser can be accessible by extremely reactive user interfaces HTML or JavaScript.

Library space with cloud service

Digital repositories or libraries are institutions of knowledge that provide access to organized digital information materials (collections), where access and maintenance are ensured over time of the collections or digital electronic resources and gadgets, to set them on track for users, groups or institutions (*Digital Library Federation, part. 1*). Libraries space with cloud services, take advantage of cloud computing services by providing electronic or digital library service using cloud. capable of managing the e-content for storing, creating, searching, accessing and retrieval of digital information materials, such as text, images, sounds, static, dynamic images and moving text or image

VIII. ADVANTAGES OF CLOUD COMPUTING SERVICE TO LIBRARY SPACE

Many benefits are attached to cloud technology services delivery, below are few examples:

- Reliability: Network and knowledge access are bound to be efficient and effective, the infrastructure guarantees the security of the collections to the customers.

- **Simplicity:** The services will be restless concerning resource management and it's easy to operate.
- **Collaboration:** Since all the resources and applications are on the cloud, it becomes naturally suitable for libraries to efficiently and effectively work together or share resources between them on a typical project or application.
- **Price:** Less in the cost of application and use.

IX. LIMITATIONS OF DIGITIZATION PROCESSES AND USE OF CLOUD SERVICES IN LIBRARY SPACE

- i. Lack of professional staff to handle digitization activities in the library or information Centre.
 - ii. Lack of personal relationship between library staff and users in the case of digital libraries.
 - iii. There is a lack of digitization policy.
 - iv. Little knowledge on cloud computing technology services.
 - v. Lack of technical personnel to handle the implementation of cloud computing services.
 - vi. Inadequate funding.
 - vii. Lack training.
 - viii. Fear of losing digitised collection.
 - ix. Security issues.
- X Internet connection failure.

X. CONCLUSION

Digitization of library collection has opened up new medium and services for libraries and the needs to be integrated into the policies and plans of any institutional library, to maximize its effectiveness and efficiency in library service delivery.

Regarding the complex nature of digitised data and information collections in information management, cloud computing services will serve as the most appropriate tools for libraries in providing effective library service delivery to users, with long-term archival and access to digitize data in the library data systems. With cloud computing services, libraries can be in the best position to handle complex data storage, information access, collaboration and information retrieval among others.

The library can benefit from the system, as it provides smooth and effective operation (open, easy access, simplicity, flexibility and reliability) in library space for effectiveness in library services.

RECOMMENDATION

In this paper, the following recommendations are made:

1. Management of institutions or libraries should understand that the digitization of library collection and cloud computing services are of paramount importance to the libraries, with digitized resources and cloud computing services a library can deliver services everywhere regardless of time, distance or location with internet connectivity, hence they should make remarkable and implementable policies that will encourage the use.
2. Considering the complex nature of digitization and implementation of cloud computing services, the management of institutions should employ library staff that are ICT inclined who also are professionals in e-library services delivery to handle the digitization activities and implementation of cloud services and also offer needed assistance and support to clientele for effectiveness of library services delivery.
3. The government should understand the global value placed on digitizing library collections and cloud computing services in digital libraries, to provide the needed funds to sustain and enhance the application and provision of such facilities and services for the effectiveness of library service delivery.
4. The information professional should ensure that adequate and relevant library collections are digitised and right cloud computing services are used, and the copyright policies to remove fear by the side of users, to attain effectiveness of the library service delivery.

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