



INTERNATIONAL RESEARCH JOURNAL OF HUMANITIES AND INTERDISCIPLINARY STUDIES

(Peer-reviewed, Refereed, Indexed & Open Access Journal)

DOI : 03.2021-11278686

ISSN : 2582-8568

IMPACT FACTOR : 6.865 (SJIF 2023)

Leveraging Cloud Computing for Enhanced Academic Library Services in Kenya: Opportunities, Challenges, and Best Practices

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DOI No. [03.2021-11278686](https://doi.org/10.21203/rs.3.rs-28111278686)

DOI Link :: <https://doi-ds.org/doilink/07.2023-96588763/IRJHIS2307013>

Abstract:

This literature review paper examines the opportunities, challenges, and best practices associated with leveraging cloud computing for enhanced academic library services in Kenya. Academic libraries in Kenya have realized the need to adjust to the digital world, where traditional library systems regularly struggle to fulfill library users' evolving demands. Cloud computing provides expandable and flexible resources that transform library services. This review synthesizes existing research to pinpoint the opportunities that cloud computing offers to academic libraries in Kenya, which include, improved accessibility, and resource dissemination. Nonetheless, challenges like data security, inadequate IT infrastructure, and privacy concerns must be addressed prudently. Furthermore, this review identifies best practices for the implementation and consumption of cloud computing in the sphere of academic library. The results of this literature review provide valuable insights into the current state of leveraging cloud computing in university libraries in Kenya, highlighting the likely benefits and challenges encountered. This review serves as a foundation for future research and provides practical implications for decision-makers, librarians, and IT specialists in the Kenyan academic library context. Ultimately, it strives to guide academic libraries in Kenya towards leveraging cloud computing to improve their services, supporting the academic success and research activities of their users in an increasingly digital world.

Keywords: Cloud computing, Cloud technologies, Academic libraries, Adoption of cloud computing

Introduction:

The 21st century has witnessed a revolution in technology, making institutions like libraries to embrace modern technologies for their services. Information communication technologies have made substantial advancements in accessing and distributing information to users. One such advancement is cloud computing (Idahosa & Eireyi-Edewede, 2023). Cloud computing entails running applications and functions on scattered networks using virtual resources retrieved through the internet. By integrating various technologies, services, and applications, cloud computing creates a self-service utility that permits the sharing and utilization of resources through the web (Bhattacharjee

& Purkayastha, 2013).

The emergence of cloud computing has transformed how information is stored, accessed, and shared, offering a favorable solution for academic libraries to modernize their services. Academic libraries in Kenya can take advantage of cloud-based solutions to overcome challenges related to limited resources, reduced physical space, and outdated infrastructure by using cloud-based solutions. According to Idahosa&Eireyi-Edewede(2023), cloud computing enables libraries to access and provide a wide range of digital resources, facilitate seamless collaboration, hence enhancing user experiences.

There are, however, challenges linked to the adoption of cloud-based technologies, particularly in developing countries. Khatib&Opulencia(2015)report that power blackouts and interruptions to electricity supply hamper online services. Data security, interoperability, limited IT infrastructure, and financial constraints are also issues that libraries must address in Kenya as they pose implementation challenges. Achieving optimal cloud computing use in academic libraries requires understanding and addressing these challenges.

This literature review strives to deliver a broad review of the existing knowledge on leveraging cloud computing to enhance university library services in Kenya. This paper synthesizes and analyzes relevant studies to highlight the potential benefits of cloud computing for academic libraries, as well as the challenges associated with adopting cloud-based solutions.

In addition, the review examines the best practices for rolling out cloud computing in academic libraries around the world. Ultimately, this review provides a solid foundation for future research and offers practical implications for academic libraries worldwide.

Methodology:

The study employed a systematic literature review to study the opportunities, challenges, and best practices of cloud computing in academic libraries. Google Scholar was selected as the platform for accessing relevant literature owing to its comprehensive coverage of academic databases and journals. The use of Google Scholar allowed for the retrieval of a broad range of high-quality publications by refining search terms and concepts.

Definition and conceptual understanding of cloud computing:

Cloud computing lacks a universally accepted definition(Oliveira et al., 2014), resulting in diverse descriptions proposed by scholars. In essence, it involves accessing and utilizing outsourced electronic resources and services through the internet. Data, information, and applications are stored on remote servers, accessible from any computer via an internet connection(Thamaraiselvi, 2016).

The organization running an application in a cloud computing environment typically doesn't own the physical hardware; instead, organizations upload files to the server over the Internet (Idahosa & Eireyi-Edewede, 2023). Despite different definitions, the core idea of cloud computing is

to empower users in overcoming resource and infrastructure limitations when accessing computing services.

Application and utilization of cloud computing in academic libraries:

Academic libraries in Kenya play a critical part in supporting the educational, learning and research needs of users. Traditionally, libraries have served as physical repositories of knowledge and resources. However, the evolving needs of library users and advancement of IT have prompted a change in library services. According to Zubairu et al. (2021), cloud computing is regarded as the technology trend that offers significant benefits to libraries.

Cloud computing technology has been extensively adopted in academic libraries, particularly in the Western world, to streamline functions and attain operational efficiency (Idahosa & Eireyi-Edewede, 2023). Research conducted by Zubairu et al. (2021) in Nigeria outlined areas where cloud computing has been implemented in academic libraries, including Library Management Software, data storage and backup, resource repositories, acquisition and cataloging. Similarly, a study in Zimbabwe by Chiparausha (2021) identified cloud-based services like institutional repositories, and communication services like video conferencing and social-media as applications in academic libraries.

Cloud computing also facilitates the use of professional forums like ResearchGate, social networking platforms for information sharing and reference services (Guchacha, 2019) as well as remote access software such as EZproxy and RemoteXs for off-campus access to electronic journals and books databases. Citation and reference management tools offered through the cloud, like Zotero and Mendeley, assist researchers in organizing references and enhancing scholarly work (Kaur & Dhindsa, 2016).

A study conducted by Maina and Muthee (2020) revealed that adoption of cloud-based services in university libraries is limited as most libraries only use basic services. Yet, leveraging cloud computing to its full potential could address many challenges encountered by libraries

Opportunities for cloud computing in academic libraries:

Utilization of cloud computing solutions in academic libraries offers several opportunities for enhancing services and functions. Cloud computing offers improved accessibility and convenience for library users. With cloud-based solutions, users can access library resources and services from any locality at any time (Makori & Mauti, 2016; Ogbu, 2013). The growth of portable devices such as smart-phones and laptops, along with the rising demand for digital information through e-learning, has accelerated the demand for cloud computing technologies in academic libraries (Kihara & Gichoya, 2014).

Moreover, cloud computing provides academic libraries with avenues to efficiently store, manage, and deliver digital resources over the internet. By leveraging cloud-based infrastructure,

libraries can overcome resource limitations and streamline information dissemination to meet the ever-growing demands of users in the digital age. According to Idahosa&Eireyi-Edewede(2023), libraries may avert financial waste and technological difficultieslikesystem crashes, computer viruses, and data loss by adopting cloud-based solutions.

One significant advantage of adopting cloud-based solutions in libraries is enhanced security. Cloud service providers employ the latest security standards to safeguard data and information stored on their networks (Azam, 2019). By entrusting data storage to these providers, libraries can minimize the risks associated with maintaining their own infrastructure and ensure better protection against data loss, leaks, and system crashes (Idhalama & Fidelis, 2020).Chiparausha(2021) adds that cloud service providers offer expertise, robust infrastructure, and insurance, ensuring data integrity, safety, backup, and recovery measures are in place.

Challenges of Cloud Computing Adoption in academic libraries:

Implementation of cloud computing in academic libraries comes with its fair share of challenges. Low bandwidth, client hardware and software configurations, and potential failures of cloud infrastructures require considerations(Maina & Muthee, 2020). Limited network coverage and high subscription costs can hinder the deployment and usage of cloud services in academic libraries(Solomon, 2022).

Data security and privacy concerns require critical considerations, since libraries should safeguard sensitive information while ensuring compliance with relevant regulations. According to Solomon (2022), this is a serious challenge since library users' data may be mined by cloud solution providers. Privacy breaches by cloud solution providers raises moral dilemmas for librarians, who must weigh the benefits of cloud computing against possible privacy risks(Chiparausha, 2021).

Interoperability issues may arise while integrating cloud-based services with existing library systems. Chiparausha(2021) observes that absence of clear policies and interoperability standards impedes proper utilization of cloud services.Additionally, budget constraints, and inadequate technical expertise present implementation challenges that require solutions to effectively leverage cloud computing in academic library services.

Other challenges include high cost of initial setup, need for dependable service providers, resource-intensive monitoring, and concerns about security (Azam, 2019).

Best Practices for leveraging cloud computing in academic libraries:

Identifying and implementing best practices is important for successful adoption of cloud-basedservices in academic libraries. Best practices encompass strategies and guidelines that can maximize the benefits of cloud computing whereas mitigating risks. Njoku& Ken-Agbiriogu (2021) state that library management should sensitize staff to be up-to-dateon the trends in IT world. This, according to Idahosa & Eireyi-Edewede (2023), can be through training and re-training in the

application of technology services.

Universities should develop standard operating procedures and policies that assist librarians' in choosing cloud computing services (Chiparausha, 2021). Njoku & Ken-Agbiriogu (2021) point out that libraries can be made functional on the aspect of information technology if developmental policies are formulated and fully implemented.

As Njoku & Ken-Agbiriogu (2021) indicate, adequate funding from the government is necessary to equip libraries and create an environment conducive to professional growth and technology adoption. Chiparausha (2021) is of the opinion that evaluation of available cloud-based technologies is required to select most cost-effective and high-performing services.

Before the adoption of cloud computing technologies, Zubairu et al. (2021) indicate that attention should be directed to privacy and safety issues. This gives clients the guarantee that the resources they possess are protected. Sufficient internet services and consistent electricity supply are also critical for smooth cloud computing implementation. Alternatively, libraries may explore alternative energy sources like solar power to supplement electricity supply (Njoku & Ken-Agbiriogu, 2021).

Best practices may also include careful planning, evaluation and selection of cloud service providers, data backup protocols, user training and support, and effective management of vendor relationships. By following established best practices, academic libraries in Kenya can enhance utilization of cloud computing resources and delivery of improved services.

Result and Discussion:

Based on the systematic literature review, cloud computing is applied in various areas of academic libraries, including Library Management Systems, Institutional Repositories, hosting library websites, and communication tools like emails and social media. The benefits of cloud computing in libraries include, elimination of time and location barriers, cost reduction, easy installation and maintenance, increased storage space, reduced risk, and readily accessible services. However, challenges such as low internet bandwidth, power disruptions, and insufficient IT infrastructures exist. To guarantee successful implementation of cloud computing, academic libraries adopt best practices like staff training, increased funding, and development of policies to address cloud computing-related issues.

Conclusion:

In conclusion, cloud computing offers numerous opportunities for academic libraries in Kenya, including increased accessibility to digital resources and seamless collaboration among users. However, adopting cloud computing in libraries comes with challenges such as data security, interoperability issues, limited IT infrastructure, and budget constraints. Implementing best practices throughout the adoption process is essential for successful implementation of cloud computing. This

comprises user training and evaluating service providers to maximize benefits and mitigate risks. By embracing cloud computing, academic libraries in Kenya can transform their services, warranting seamless accessibility of digital resources to support academic success and research endeavors of their users.

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