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IMPROVING THE ACCESSIBILITY OF LIBRARY SERVICES USING CLOUS-BASED DIGITAL LIBRARIES

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ABSTRACT

This article aims to provide an understanding and examine the application of cloud-based digital libraries in improving the accessibility of library services. The methodology adopted is the narrative literature review, which involves finding, evaluating, and synthesizing previous publications. The results show that cloud-based digital libraries can make library services more accessible. However, there are some disadvantages, including privacy and data security issues, such as hacking, leaks, and illegal access

INTRODUCTION

The rapid development of information technology has a significant impact on a number of different areas, including the library sector. This is evidenced by the advent of digital libraries which facilitate convenient online access to information for library users, obviating the need for physical library visits. As defined by Qalyubi in (Wahdah, 2020), a digital library is a repository for digital information and materials, whether originally published in digital form or digitized from printed, audio-visual, or other formats. However, traditional digital libraries will generate vast quantities of digital data with considerable storage capacity (Fikri & Afrianto, 2023). The storage will reach its maximum capacity if the library continues to carry out its activities over a period of years.

To overcome this, the common solution is to delete old data or add new storage capacity. While adding new storage can solve the problem of lack of space, it also has the potential to add considerable waste and cost. For this reason, cloud-based digital libraries can be an effective solution to overcome these challenges.

Cloud-based digital libraries are digital libraries that utilize cloud computing technologies in their infrastructure, where cloud computing represents a model for providing convenient, on-demand network access for multiple users to share configured computing resources (e.g., networks, servers, storage, applications, and services) that can be quickly established and released with minimal management effort or service provider interaction. This suggests that cloud computing allows users, both individuals and organizations, to access IT infrastructure such as networks, servers, storage, and applications without the need to build or manage such infrastructure directly (Indrawan, et al. 2024).

Cloud computing enables the flexible expansion and contraction of data storage capacity in response to changing needs. Moreover, existing data can be accessed and shared from any location with an internet connection (Alfarizi & Ikasari, 2023). This enables libraries to continually expand their digital collections and provide a greater range of materials that can be accessed by a larger number of users. Moreover, cloud computing has the potential to reduce expenditure on the development of library automation systems (Christiani, 2018). The ability of cloud computing to provide access to computing resources over the internet allows companies and individuals to store data, run applications, and perform computing processes without the need to have expensive IT infrastructure (Ilahi et al., 2024).

As evidenced by numerous prior studies, including the study entitled "Cloud Computing-Based Library," conducted by Wulansari, the article posits that cloud computing facilitates enhanced operational efficiency for organizations, particularly in the context of library services, user access, data processing, and storage, all of which can be accessed at any time and from any location. Nevertheless, significant challenges pertaining to privacy and data security persist (Wulansari, 2015). In another study, entitled "The Use of Cloud Computing as Librarian Knowledge Sharing," conducted by Fitri Handayani, the article states that librarians can engage in knowledge sharing through cloud computing, which provides storage of various forms of digital material in the

library. This benefits librarians in providing excellent service to users in this digital age (Handayani, 2019).

The purpose of this article is to provide an understanding and examine the application of cloud-based digital libraries in improving the accessibility of library services. This article will discuss the application of cloud-based libraries, exploring how this technology can improve library services. The article will also discuss the opportunity and constraints associated with implementing cloud computing

METHOD

This article uses a literature review to identify, evaluate, and synthesize previous or existing research results (Putri et al. 2020). Aryana in Sugiyono (2021) explains that qualitative research methods with a descriptive design, are carried out intensively, analyzing intensively, analyzing reflections on various documents found, and making detailed research reports. research in detail. The purpose of this research is to analyze a number of articles that refer to cloud computing as a potential solution to improve services in library collection management. The data obtained comes from secondary sources by searching the website with the keywords "Article with literature study research method," after which it will bring up several pages containing related journals, so the top three journals on the first page of search results were selected by adjusting the method, and then will be connected and compared with the theoretical framework based on the implementation of cloud computing in the library. This analysis will generate insights into the potential benefits and constraints of using cloud computing as an alternative service solution in libraries. The findings from this analysis will be used to identify strategies to overcome the obstacles associated with the implementation of cloud computing as an alternative service solution in libraries.

DISCUSSION

The Role of Cloud Technology in Enhancing Library Services

With the current era of technology, cloud-based has become a technology that plays an active role with its more flexible, scalable, and efficient use in the library sector. The use of cloud base in digital libraries will be discussed in the following section. Libraries can plan services by preparing infrastructure, data security, and human resources. Several conclusions were drawn from the literature research, including the fact that cloud computing increases library efficiency by allowing users to access materials

anytime and from anywhere. Some libraries that provide electronic libraries (e-library) have also used cloud computing to provide online access to various information sources, such as scientific journals, articles, electronic books, and databases that make it easier for students and educators to find information quickly and efficiently. Cloud computing service providers integrate with software in libraries, digital libraries, search engines, etc.

Additionally, Cloud-based systems inform library patrons of the developed timetable. This facilitates the quicker return of library-checked books. By using user-centered principles, cloud-based applications in various libraries are better equipped to arrange services (Fikri et al., 2023).

There is an example in data security in Christiani's (2018) research, PUSTAKA prepares to adopt Fujitsu's cloud base service security idea known as “trusted service platform”. This idea protects data security by utilizing virtualization technology to logically separate the network, operating system, and data layers. This concept is simple and easy to accept to maintain data security. The data center consists of three virtual repositories: virtual storage that stores encrypted data, virtual servers that store encrypted networks, and virtual networks that store terminal authentication and approvals.

However, The implementation of a cloud-based digital library also faces challenges, as noted in (Wangsit, 2022) research, which states that during the procurement process of cloud computing, specifically the purchase application, librarians were questioned by the budget committee regarding the usefulness and functionality of cloud computing. And there have been instances of damage to the infrastructure of the implemented cloud computing. Therefore, it is advisable that once cloud computing has been implemented in the services, the library should upgrade the infrastructure in its private cloud to function optimally according to storage needs.

In a recent study by (Isiaka et al., 2024), the adoption of cloud computing services in academic libraries across Nigeria was found to significantly enhance service delivery and user engagement. Librarians in these institutions employed platforms such as OCLC and Google Docs to manage and share library content more efficiently. Despite persistent challenges like unreliable internet connectivity and power supply, the study highlighted that cloud technologies still contributed positively to increasing user satisfaction and broadening access. This finding reinforces the global relevance of cloud-based models,

especially in contexts where resource constraints pose a barrier to traditional infrastructure.

Advantages of Cloud-Based Digital Libraries

Cloud-based digital libraries provide significant benefits and changes in service development by providing high scalability, availability, accessibility, and reliability, allowing users to manage their data more efficiently and focus on application development and innovation. Even the use of a cloud-based can ensure that its users can always have the latest documents and reduce costs. According to Tantowi et al.'s research from 2023, cloud-based offers the following advantages: comparatively low costs, paperless support, digital document preservation, ease of use, remote access to document files, file sharing, and a large storage capacity. Cloud storage allows both individuals and companies to manage digital data in a variety of ways.

Furthermore, (Bhagat, 2021) emphasizes that cloud-based platforms enable libraries to offer flexible, secure, and user-friendly access to resources, both online and offline. With features like automated backups, customizable interfaces, and mobile accessibility, cloud systems enhance user engagement and simplify backend operations. These tools also support librarians in managing acquisitions, cataloging, and circulation tasks more efficiently, resulting in error-free services and better decision-making through dynamic reporting tools. Such improvements align with the shift toward smarter, data-driven library environments capable of adapting to user demands in real time.

The second element is an opportunity derived from the use of cloud storage, which is one area of cloud computing, namely in digital documents based on the identification found in three journal publications. The cloud's cost-effectiveness, ability to be subscribed to base on the organization's financial capacity, lack of long-term contracts, provider-performed maintenance, the agility needed to handle digital documents, and its flexibility.

The use of cloud-based technology in digital libraries has several benefits. First, process automation expedites the loan and return of books, reducing user wait times. Second, by making it simpler for users to locate the volumes they're looking for, online collection search engines increase search efficiency. It is also clear that book stock monitoring has advantages. By using information technologies to track the most popular

books, libraries may better respond to user demands and optimize the selection displayed in Zuhriansah's periodical (2024).

Cloud-based enables the flexible expansion and contraction of data storage capacity in accordance with requirements; data can be readily accessed and shared from any location at any time with an internet connection; cloud infrastructure is highly reliable to ensure data availability; and cloud providers typically employ stringent security measures to safeguard user data (Alfarizi, 2023). Since information can be found and accessed quickly, cheaply, and effectively, cloud computing is crucial in helping to increase the effectiveness of teaching and learning in the age of distant learning.

Knowledge management is needed to accompany cloud-based in enhancing librarian services. KM offers an opportunity for information and library professionals to make themselves relevant to their parent organization. By publishing knowledge created in the environment electronically, the library can add value to its parent library. From the context of expertise, librarians can achieve KM positions provided they are able to adapt and develop themselves in line with the demands of change (Maria in Handayani, 2019).

Constraints on Cloud-Based Digital Library Implementation

The use of cloud-based in digital libraries has many advantages, but even so there are several obstacles in its use such as concerns about data security and privacy which are the main obstacles in adopting cloud computing (Wulansari, 2015). Another obstacle that occurs is that cyber hazards such as hacking, leaks, and illegal access can affect data stored in the cloud, including user information, digital collections, and loan transactions (Ilahi et al., 2024). When data is kept on servers run by cloud service providers, which may be situated in other nations with distinct data protection laws, data management and security become more complicated. Data leakage will therefore increase as a result of the user's disregard for the unimplemented regulations. This can be done either by service providers or internal users within the organization or company itself (Tantowi & Wijayanti, 2023). Therefore, digital libraries must ensure strict security policies, data encryption. the use of strong passwords, multifactor authentication, and periodic audits of the cloud service providers used (Nasution, 2023)

The relevance of cloud computing also became particularly evident during the COVID-19 pandemic, as highlighted by (Asifor & Emezaivwakpor, 2023). With physical contact restricted, libraries had to shift rapidly to virtual platforms, leveraging Software-

as-a-Service (SaaS) models to offer reference and communication services online. Through tools such as instant messaging, digital reference forms, and VoIP, librarians maintained vital user interactions while minimizing health risks. This period not only underscored the adaptability of cloud technologies but also revealed their essential role in ensuring service continuity during public emergencies.

The company can guarantee security in terms of network connection and application type security. However, other security should also be considered by users, such as in terms of file access that allows viewing and editing files. It is recommended not to give access to just anyone and not to access files in an arbitrary manner (Suryawijaya & Praptodiyono, 2024).

Cost analysis and implementation expenses might be substantial when moving to the cloud (Ilahi et al., 2024). Subscription fees and prolonged use of cloud services can be costly for libraries, even though cloud computing can lower the cost of physical infrastructure. Because of this, libraries are able to assess their needs, choose the most affordable cloud services, employ the tools and strategies offered by cloud service providers, and engage in negotiations with them.

The library must select a cloud service provider with a strong SLA (Service Level Agreement) because utilizing cloud-based also means that it is dependent on the provider for infrastructure, maintenance, and technical support. For example, the library may experience service interruptions (downtime) due to reliance on the internet connection (Ilahi et al., 2024). Additionally, in order to use cloud computing, users require reliable and quick internet access, and in certain areas or nations, internet infrastructure is not as developed as it could be. This can interrupt access to digital collections and hurt users. In order to improve service availability and have a plan to restore services in the event of a breakdown, libraries can employ a hybrid (mixed) public and private cloud and store data in multiple places (Ilahi et al., 2024).

Furthermore, the mindset of the library's human resources department may also contribute to the difficulties in implementing cloud-based in digital libraries. This is because not all human resources are able to adapt to the upcoming improvements in library automation technologies. In order to improve library services and progress automation, more thorough counseling regarding cloud-based is required to prepare library human resources to embrace new technology (Christiani, 2018).

CONCLUSION

Cloud-based digital libraries offer a great opportunity to improve the accessibility of library services. With benefits such as seamless access and support for remote access, this technology can be a long-term solution for libraries in the digital age. In addition, libraries can effectively maintain and preserve collections, providing online access to information resources. The technology also promotes reduced infrastructure and operational costs, as it does not require bulky hardware or self-managed servers. However, despite its many advantages, cloud-based digital libraries also present challenges such as data security, privacy or other cyber hazards and other challenges, which can be overcome by collaboration between parties including libraries, technology service providers, institutions and governments. Additionally, innovations in cloud-based digital libraries go beyond technical efficiency—they represent a broader transformation of libraries into centers of collaboration and lifelong learning. Maysa et al., 2024, found that libraries that integrate cloud computing with creative spaces, digital repositories, and AI-driven services are more capable of responding to dynamic user needs. These developments have positioned libraries as hybrid spaces that combine traditional functions with modern, technology-enabled services. As libraries continue to evolve, embracing cloud innovations will be key to maintaining their relevance in an increasingly digital and interconnected society. Therefore, cloud-based digital libraries can be an effective tool in increasing the accessibility of library services which can improve user convenience in accessing information and knowledge.

RECOMMENDATION

From the discussion that has been presented above, there are a number of recommendations given to several parties, one of which is the library, these suggestions include that the library needs to provide training or workshops on how to access and use digital libraries, this will help provide an understanding of library staff who still do not understand the use of cloud-based technology so that it will help streamline the library work process. In addition, this training will help patrons understand the platform and services offered by the library. To enhance digital collections and make them more accessible to the public, libraries can also expand their network of partnerships with other organizations, publishers and academic institutions. Libraries should also continuously

update their security systems to guard against cyber-attacks on user information and digital collections.

Technology service providers should provide better and scalable cloud infrastructure so that there are no concerns regarding capacity limitations, in addition, service providers must provide strong security solutions so that service users have confidence in technology systems.

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