

Cloud Computing in Academic Libraries: A Bibliometric Analysis of Global Research Trends

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ABSTRACT

Cloud computing has become a key technological enabler for the digital transformation of libraries, allowing institutions to improve information access, service scalability, and infrastructure efficiency. In recent years, libraries have increasingly adopted cloud-based platforms to support digital collections, remote access services, and collaborative information environments. This study presents a bibliometric analysis to explore global research trends in cloud computing within the field of Library and Information Science (LIS) during the period 2014-2024. Data for the study were retrieved from the Web of Science Core Collection and analyzed using bibliometric techniques with tools such as Biblioshiny and VOSviewer. The analysis examines publication growth, authorship patterns, leading countries, influential journals, citation impact, and keyword co-occurrence networks. The findings reveal a consistent increase in scholarly output on cloud computing in libraries, particularly after 2020, reflecting the growing importance of digital infrastructure and remote service delivery. The United States and China emerge as major contributors to this research domain. Frequently occurring themes include cloud adoption, digital libraries, user acceptance, service innovation, and emerging technologies. The study highlights the evolving role of cloud computing in modern library environments and identifies future research directions for developing smart and technology-driven library services.

KEYWORDS: Cloud computing, Bibliometric analysis, Digital libraries, Research Trends, Digital Transformation.

1. INTRODUCTION

The rapid advancement of digital technologies has significantly reshaped the operations of modern libraries, resulting in a transition from traditional infrastructure to cloud-based service models that enhance accessibility, scalability, and cost efficiency (Kumar, 2017). Cloud computing allows libraries to provide a range of online services, such as digital repositories, electronic resources, and collaborative learning environments without relying on extensive hardware support (Yuvaraj, 2016). The cloud technology enables libraries to offer on-demand access to information resources using remote servers and simplify the daily workflow and minimize the cost of maintaining physical servers (Njoku & Ken-Agbiriogu, 2021). Over the last few years, cloud computing has attracted massive interests in the field of academic and research libraries across the globe. Past research emphasizes its success in enhancing the efficiency of services, automation, digital preservation, and user satisfaction in general. Karthika et al. (2024) highlighted that the cloud-based library systems help the creation of innovative services like Software-as-a-Service (SaaS) platform, cloud-based OPAC, institutional repositories, and virtual reference services. In a similar manner, Atuase (2019) reported that cloud technologies contribute to the minimization of financial and technical barriers, which is why they are especially useful to libraries of small size in terms of infrastructure and resources. Although used more and more, libraries are still on various levels of cloud maturity, and the overall picture of the research trends in the given field is still needed. Thus, this work implements the bibliometric analysis of the published works on cloud computing in the field of Library and Information Science (LIS) in the period of 2014-2024 to recognize major patterns of publications, most significant authors, leading journals, and new trends in research in the field.

2. LITERATURE REVIEW

Research on cloud computing in the Library and Information Science (LIS) domain has grown significantly over the past decade, mainly driven by its ability to enhance digital access, scalability, and cost-efficiency in library operations. Kumar (2016) talked about the initial implementation of the services of cloud-based providers in the academic libraries, outlining how the technologies decrease the reliance on the physical infrastructure and enhance sharing of resources. Also more recently, Asim, Arif, and Rafiq (2024) highlighted the growing adoption of cloud technology to support smart and digital library services as a shift towards experimentation to practical application in the current academic landscape. On the same note, previous researchers such as Jianru (2013) and Yan-Xian (2013) have indicated that there has been an increased acceptance of cloud computing in LIS research, especially in the Asian academic environment. In addition to the adoption studies, technological issues have been investigated as well as the scholars with great interest in data security, privacy, and trust. Garg, Sidhu, and Rani (2019) pointed out that it is essential to resolve security vulnerabilities and user trust problems in the cloud. The article by Baldwin et al. (2018) made a contribution to this aspect by discussing the concept of cloud forensics and the need to counterbalance digital threats and confirm that cloud computing is scalable and flexible, it should be implemented with the help of well-developed governance and security models. Also, other bibliometric analyses have charted the development of the research on cloud computing as a wider technological domain. Cai et al. (2015) and Yu et al. (2018) found cloud computing to be a fast-growing research field in a variety of fields, whereas Heilig and Vob (2014) presented scientometric indicators of its initial hegemony in the fields of computer science and engineering. More modern works by Dima et al. (2022) and Goncalves et al. (2023) narrowed this down to education and organization adoption in the context of digital transformation. Nevertheless, the majority of these publications are

either too old or lack the scope of the LIS field, especially since 2020 when cloud computing was crucial in accessing and maintaining continuity in distant developments. Thus, although the literature on the topic of adoption, security, and global trends is rich, there is an evident gap in the most recent bibliometric analysis that takes into account cloud computing in the LIS field during the periods of 2014-2024. This is where the current research fills the gap by applying narrow quantitative research on the publishing trends, the influential authors, sources, and commonly used keywords in the cloud computing studies in the context of LIS.

3. OBJECTIVES OF THE STUDY

This study aims to visualize and analyze global research trends in library cloud computing within the LIS domain.

The specific objectives are:

- ❖ To analyze the publication growth trend related to cloud computing in LIS from 2014 to 2024.
- ❖ To identify the most productive authors, institutions, and countries contributing to this research domain.
- ❖ To examine the most influential journals and highly cited publications.
- ❖ To analyze frequently occurring keywords using word cloud visualization
- ❖ To identify thematic research clusters and influential citation relationships using network visualization.

4. RESEARCH METHODOLOGY

This study uses a quantitative bibliometrics research method in order to examine the trends in cloud computing research across the world with regard to Library and Information Science (LIS) field. The Web of Science (WoS) Core Collection was searched with the help of the following key words: Cloud Computing, Library Cloud Services, and some other similar terms as the search parameters were confined to the LIS subject category and the last five years (2014-2024). Only peer-reviewed journal articles, reviews, and conference papers were included, while duplicates and irrelevant records were removed manually. The final dataset was analyzed using Biblioshiny for statistical and performance indicators, VOSviewer for network visualization, and Microsoft Excel for data structuring. The study examined annual publication trends, top authors, institutions, countries, journals, keyword co-occurrence, and citation impact, providing a comprehensive visualization of research progress in library-focused cloud computing. Therefore, this study applies a bibliometric approach to systematically visualize how cloud computing research in LIS has evolved over the past decade at global scale.

5. DATA ANALYSIS AND FINDINGS

This section provides a comprehensive analysis of the bibliometric dataset to uncover key trends, research patterns, and scholarly contributions in the domain of cloud computing within (LIS) from 2014 to 2024.

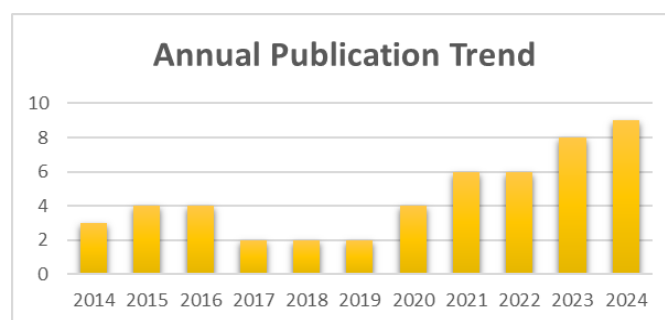


Fig 1: Annual Publication Trend (2014–2024)

Figure 1 shows the pattern of publishing annually. Trend analysis of the publication trend recently (2014-24) indicates that there is a steady and systematic increase in academic publications concerning cloud computing in the (LIS) field. The initial period starts with a small research activity between 2014 and 2017 with less than five years of publications each year. Nevertheless, one observes an upward trend since 2020, which might be conditioned by the growing need to use cloud-based solutions in the context of the digital transformation and remote working necessities created by the COVID-19 pandemic. The peak of the research output was reached in 2023 (8 publications) and in 2024 (9 publications at the same time 3 publications were first indexed under early 2025). Such positive trend makes it clear that cloud computing has become a strategically significant and actively studied field of LIS, which means that cloud computing becomes a part of digital library infrastructure and service development.

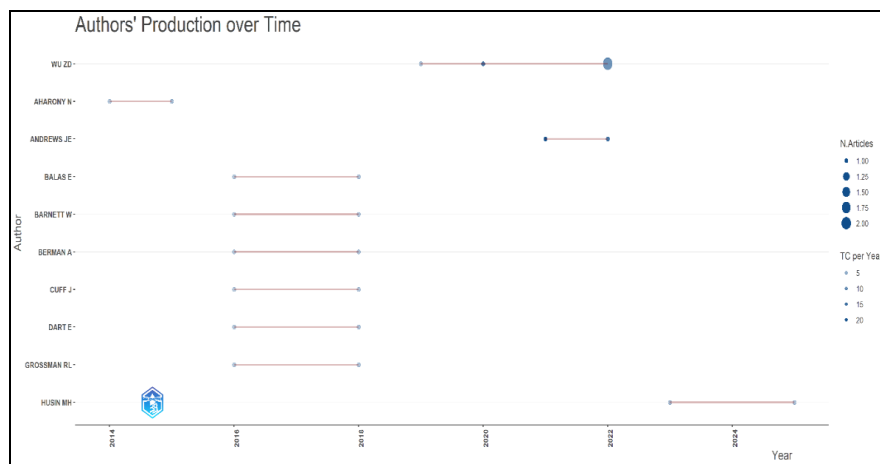


Fig 2: Research Productivity of Top Authors

This Figure 2 shows the research productivity of key authors over time in cloud computing within LIS. Wu Z.D. is the most active author, publishing consistently across multiple years and with the highest number of articles and citations (larger and darker circles). Other authors, such as Grossman R.L., Cuff J., and Aharony N., contributed fewer papers in specific years, indicating occasional but notable participation. Overall, the visualization shows that most authors contributed only once, while Wu Z.D. sustained long-term involvement, making him the most influential in this research area.

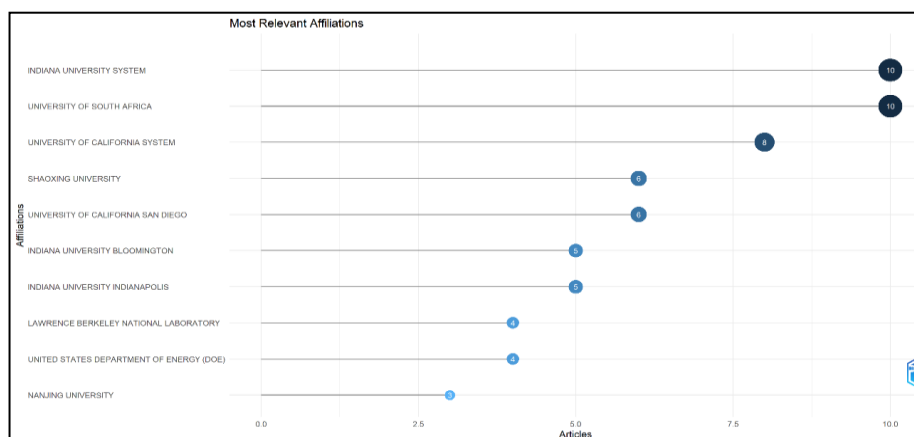


Fig 3: Most Relevant Institutional Affiliations

The Figure 3 shows the most productive affiliations (institutions) contributing research in cloud computing within the LIS domain. Indiana University System and University of South Africa are the top contributors, each with 10

research publications. They are followed by University of California System (8) and Shaoxing University (6). Other institutions like University of California San Diego, Indiana University Bloomington, and Indiana University Indianapolis also show notable scholarly output. In summary, research productivity is led by major academic institutions from the USA and South Africa, indicating strong institutional leadership in cloud-based LIS research.

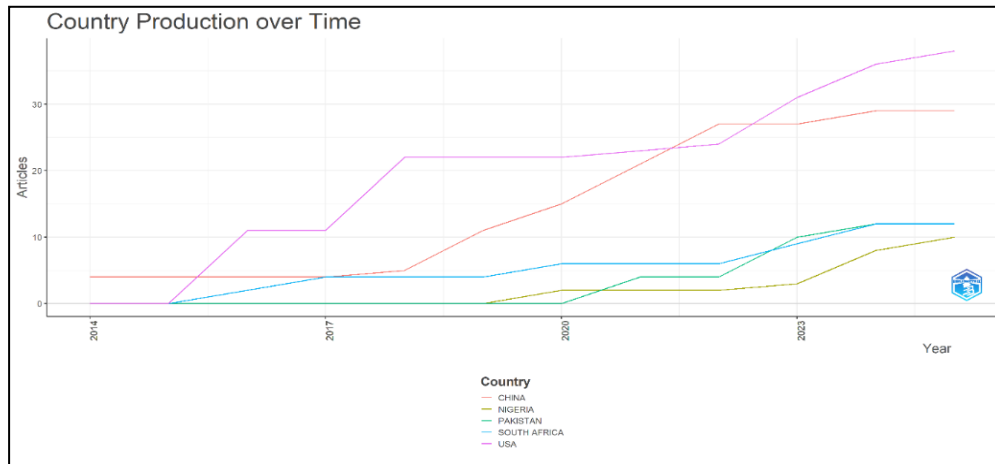


Fig 4: Country-wise Research Output Growth in Cloud Computing

The Figure 4 demonstrates how various countries published in the course of time. As can be observed, the United States has become the most productive nation, recording a keen and steady increase in research output over the years. In the second place comes China, with a steady growing trend. The countries of Pakistan and South Africa have moderate but slow growth in their number of publications. The trend of Nigeria in terms of contributions is positive over the last few years, despite the fact that it began to contribute rather late compared to others. On the whole, the United States is at the forefront with China coming in the second position, and the rest of the countries have steady but relatively low levels of research productivity.

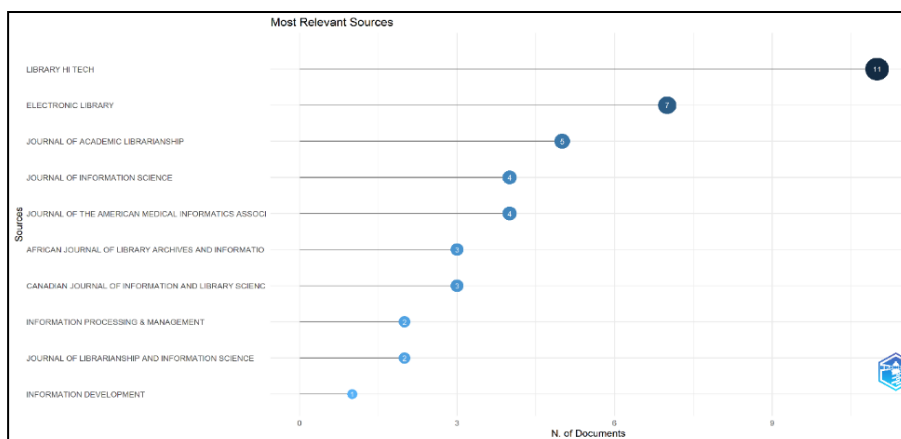


Fig 5: Most Relevant Journals/Sources

This Figure 5 presents the most topical journals or sources where the research on cloud computing within the LIS sphere is published. The number of publications published by Library Hi Tech and Electronic Library are the highest, which means that the two are quite focused on digital library innovation. Academic contributions are also

important in other journals such as the Journal of Academic Librarianship and Journal of Information Science. This proves that the research on cloud computing is mainly released in technology-oriented journals as well as digital library-oriented journals, which as such are directly applicable to the current day library transformation and deployment of intelligent services.

Table 1: Top Highly Cited Publications

Authors	Publication Year	Times Cited (WoS Core)
Andrews, JE; Ward, H; Yoon, J	2021	105
Wu, ZD; Li, RC; Zhou, ZF; Guo, JF; Jiang, JH; ...	2020	87
Cao, GH; Liang, ML; Li, XG	2018	70
Yoon, J; Andrews, JE; Ward, HL	2022	56
Habernal, I; Ptáček, T; Steinberger, J	2014	54

The five most highly cited publications used in the dataset are shown in Table 1. The article by Andrews, Ward, and Yoon (2021) is the most influential and is cited 105 times in research, which proves the considerable influence in this field. It is preceded by Wu et al. (2020) having 87 citations and Cao et al. (2018) having 70 citations. Even more recent sources like Yoon et al. (2022) have received significant academic interest and have reached 56 citations, which proves the topicality of the subject matter. Also, the previous studies, such as Habernal et al. (2014), have a large number of citations up to 54, which proves its permanence and role in the formation of this sphere.

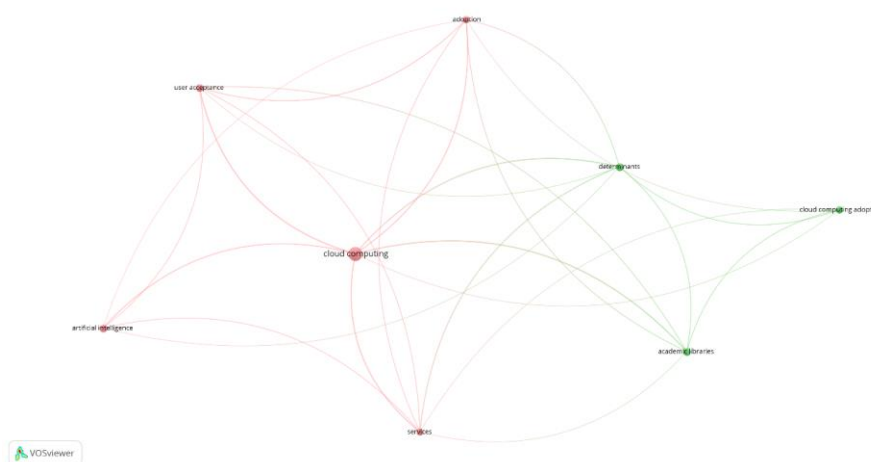


Fig 6: Keyword Co-occurrence Network

This Figure 6 shows VOSviewer keyword co-occurrence network, it is possible to see that a keyword like cloud computing appears to be the central and most powerful research theme that is interconnected with such terms as academic libraries, services, cloud computing adoption. This fact shows that the implementation and service enhancement of cloud technologies in the library setting is the topic of a considerable part of the literature. Moreover, the keywords such as user acceptance, determinants, and adoption depict that a research focus on determining the factors that affect the adoption of cloud-based systems and their acceptance is well done. The association of AI with the cloud computing and user acceptance implies that the tendency of implementing AI in cloud computing library services is increasing. On the whole, the network indicates a significant change in the

research orientation which focuses on the digital transformation of libraries, technology adoption, user behaviours and innovation of services.



Fig 7: Keyword Word Cloud

The Figure 7 is used to pinpoint the most common keywords in the research literature. The most dominant term is presented in the form of the so-called cloud computing, which means that this concept is the main theme of the studies under analysis. The other keywords that are present in significant numbers include user acceptance, cloud computing adoption, academic libraries, artificially intelligence, services, and determinants which are indicative that the researchers are majorly concentrating on the adoption of technology, user behaviour, and the use of cloud-based services in libraries and academy. The development of such notions as big data, internet of things, and machine learning demonstrates changing tendencies and the adoption of new sophisticated technologies in library science study. In general, it can be seen that the word cloud is an indicator of a robust focus on research regarding the digital transformation of libraries with the help of cloud technologies and other things.

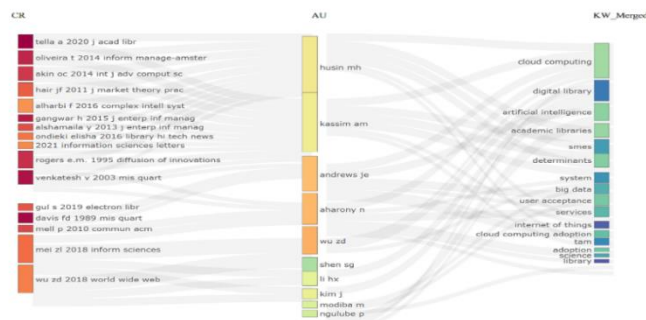


Fig 8: Three-fold Sankey Network (CR–AU–KW)

In Figure 8 shows three-fold Sankey diagram, the intellectual structure of the research field is displayed with the connection of the majority of the references (CR), influential authors (AU), and the most common research keywords (KW). It shows clearly that the highly cited one, including those by Tella (2020), Oliveira (2014), and Hair (2011), are closely related with important contributory authors like Husin MH and Kassim AM that almost all research topics are related to cloud computing, digital libraries, artificial intelligence, and academic libraries. The flow displays the high interchangeability of seminal works, active authors and trending research directions, showing how scholarly influence influences thematic development of the field.

DISCUSSION

The trends in the research analysis of the period 2014 to 2024 indicate a steady and growing increase in academic interest to cloud computing in the LIS world over time and a substantial influx of interest after 2020. This trend is strongly associated with the pressures of the digital transformation brought about by the COVID-19 pandemic, which led libraries across the globe to use cloud-based solutions to provide an opportunity to remain remote while accessing services in real-time and collaborating remotely or continuing to provide services offline. The fact that the number of publications has reached its highest point in 2023 and 2024 also shows that cloud computing is not a fad in technology but a long-term research focus in LIS. The outcome of the author productivity analysis is that Wu Z.D. is the most influential and constant contributing scholar whereas most of the other authors contributed at sporadic intervals, this means that the field is in the development stage and not run by few individuals. The institutional productivity outcomes also exhibit good contributions of large academic and research universities especially in technological advanced areas and this proves even higher the strategic interest of global institutions in modernization of libraries through cloud-based. The fact that such high-impact and technology-focused LIS journals as *Library Hi Tech* and *Electronic Library* are leading the pack substantiates that the research in cloud computing is being given a high priority by high-impact and technology-driven LIS journals. Likewise, the most mentioned sources reveal the significant emphasis on the adoption models, user acceptance, digital service enhancement, and library automation, which proves the popularity of such theoretical frameworks as TAM and UTAUT. The latter phrase, co-occurrence and word cloud analysis, supports the idea that the keyword cloud computing is still the major theme, which is closely related to the academic libraries, services, user behavior, and adoption. The advent of AI, big data, and machine learning indicates that a research direction has clearly shifted to smart and intelligent next-generation digital library ecosystem.

CONCLUSION

This bibliometric study highlights the growing importance of cloud computing in the field of Library and Information Science (LIS) over the period 2014-2024. The analysis shows that there is a consistent growth in the number of publications in research, especially since 2020 which indicates the growth in the role of cloud technologies in supporting digital library services, remote access, and scalable information infrastructure. This shows that such countries as the United States and China are on the forefront in terms of making research contributions in this area, with a number of developing countries slowly making their contributions. Analysis of key words and citations reveals key themes of research to be cloud adoption, digital libraries, user acceptance, and service innovation. Also, some new research issues like artificial intelligence, big data, and smart library systems are already starting to guide the research directions. In general, cloud computing is currently emerging as an essential part of modern library ecosystem that will help libraries to provide more efficient, flexible, and technology-oriented services to the changing information needs of consumers.

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