75 Years Smart Library Research on Scopus Database: A Bibliometric Analysis and Information Mapping

75 Tahun Penelitian *Smart Library* pada Database *Scopus*: Analisis Bibliometrik dan Pemetaan Informasi

Arwanto[1], **Dewi Endah Wigati**[2]
gyarr@leeds.ac.uk[1], p102221001@unhas.ac.id[2]

e-ISSN: **2723-6234**
p-ISSN: **2723-6226**
Indonesian Journal of Librarianship Vol. 5 No. 1, Juni (2024): pp. 15-30

Submitted: Mar 25 2024; **Revised**: Jun 20 2024;
Accepted: Jun 27 2024; **Online Publication**: Jun 30 2024;

How to Cite: Arwanto, A., Wigati, D.E. (2024). 75 Years Smart Library Research on Scopus Database: A Bibliometric Analysis and Information Mapping. Indonesian Journal of Librarianship 5 (1), pp.15-30. DOI: https://doi.org/10.33701/ijolib.v5i1.4152

Corresponding Author:
Email: gyarr@leeds.ac.uk
Affiliation: University of Leeds, West Yorkshire, **United Kingdom**

Publisher
Library Department of Governance Institute of Home Affairs (IPDN) Jatinangor in Collaboration with Gerakan Pemasyarakatan Minat Baca (GPMB) National Library of The Republic of Indonesia

Editorial Office
Jalan Ir. Soekarno KM 20 Jatinangor, Sumedang Regency, West Java, **Indonesia** (45363)
Website: http://ejournal.ipdn.ac.id/ijolib
e-*Mail*: perpustakaan@ipdn.ac.id, ijolib@ipdn.ac.id

[1] University of Leeds, Woodhouse, Leeds LS2 9JT, **United Kingdom**
[2] Hasanudin University, Jl. Perintis Kemerdekaan KM.10 Tamalanrea Indah, Makassar City, East Sulawesi Province (90245), **Indonesia**

Abstract

Background: *Library employs advanced technology to facilitate digital access and offer smart services. Despite numerous benefits, different issues arise with the implementation of smart library, such as limited accessibility and technological challenges and malware attact.* ***Purpose****: This research aimed to analyze the mapping trends and accessibility challenges in smart library implementation.* ***Method****: A quantitative paradigm was used with a bibliometric method and the results were collected, summarized, and analyzed using the keyword from the Scopus database, focusing on titles without restricting the publication year. In addition, data were analyzed and mapped using VOSviewer.* ***Result****: The information that describes the research findings. A total of 347 articles were found in the Scopus database and 260 were identified after analyzing for high relevance. Meanwhile, the number of publications increased significantly in 2018, with continued growth through 2021 and 2022. The peak research activity occurred in 2021 and 2022, with 61 and 58 publications, respectively.* ***Conclusion****: The most frequently occurring keywords included book, internet, Internet of Things (IoT), university library, library service, transformation, academic library, RFID, smart service, and public library. In this context, research in the field was related to information technology, services, and transformation into smarter and more efficient library.*

Keywords: *Smart Library, Bibliometric, Scopus, Keyword Analysis*

Abstrak

Latar Belakang: Perpustakaan mulai memanfaatkan teknologi untuk menyediakan akses terhadap sumber informasi secara digital. Perpustakaan berusaha memberikan layanan perpustakaan kepada user dengan layanan pintar (Smart Library). Meskipun memiliki banyak manfaat, namun ada beberapa masalah yang timbul akibat adanya smart library misalnya, keterbatasan aksesibilitas, terdapat potensi bahwa pengguna yang tidak terbiasa dengan teknologi atau tidak memiliki akses ke teknologi dan serangan *malware*. **Tujuan**: Tujuan penelitian ini yakni untuk menganalisis situasi dan tren perkembangan publikasi penelitian di dunia yang judul penelitiannya mengandung unsur "smart library". **Metode**: Penulis menarik data, merangkum, menganalisis hasil publikasi/penelitian menggunakan keyword "smart library" terhadap database scopus dengan membatasi hanya pada judul saja tanpa membatasi tahun publikasi. Penulis merangkum dan menganalisis topik penelitian utama, dan menganalisis topik penelitian utama dan menampilkan hasil menggunakan VoS Viewer. **Hasil**: Publikasi ilmiah dengan subjek "smart library" pada pangkalan data scopus ditemukan sebanyak 347 artikel. Setelah dianalisis dengan relevansi yang tinggi, ditemukan 260 artikel. Terdapat tren peningkatan jumlah publikasi dari tahun ke tahun. Jumlah publikasi mulai meningkat secara signifikan pada tahun 2018, dengan peningkatan yang terus berlanjut hingga tahun 2021 dan 2022. Puncak penelitian terjadi pada tahun 2021 dan 2022 dengan jumlah publikasi sebanyak 61 dan 58 publikasi. **Kesimpulan**: Kata kunci yang paling sering muncul dalam penelitian tentang smart library antara lain buku (book), internet, Internet of Things (IOT),

perpustakaan universitas (university library), layanan perpustakaan (library service), transformasi (transformation), perpustakaan akademik (academic library), RFID, layanan pintar (smart service), dan perpustakaan umum (public library). Penelitian dalam bidang smart library seringkali berkaitan dengan teknologi informasi, layanan perpustakaan, dan transformasi perpustakaan tradisional agar menjadi Perpustakaan yang lebih pintar dan efisien.

Kata kunci: smart library, bibliometric, scopus, analisis kata kunci

I. INTRODUCTION

Background. Library cannot be separated from the role of information technology (Barsha & Munshi, 2024; Rangel & Humphrey-Murto, 2024). Before the development, library was a repositories of book collections and warehouses (Garnar & Tonyan, 2021; Pawley, 2017). In this context, digital access was used to provide information sources due to the advancement in technology (Higgins & King, 2013). The application of technology started in the 1970s with the development of Online Public Access Catalog (OPAC), which allowed users to search for information sources through computer (Ternenge et al., 2020). With continuous advancement, the internet was used to provide access to digital information sources, such as e-journals, e-books, and online databases. The growth of digital resources increased after COVID-19 pandemic, leading to a significant expansion of digital information and library services (Mehta, 2020; Pambayun, 2021; Rafiq et al., 2021).

After the pandemic, library leveraged information technology to offer online services (Winata, 2021). In addition, users no longer need to visit since services can be accessed through online. Technological advancements, including big data, machine learning, and artificial intelligence, have expanded the scope. These technologies provide a broader, more accurate, and reliable range of information sources to users. Today's library evolves with technological developments, striving to offer increasingly smart services to users.

Since the concept of smart library was proposed in 2003, the "smartification" of the management and services has experienced rapid development. Several research have attempted to define the concept but there is no universally accepted or unique definition. Li et al. defined the concept as a range of services without spatial limitations (Li et al., 2021). Meanwhile, Aittola et al. described smart library as "a location-aware mobile service that helped users find books and other materials" (Aittola et al., 2003). This concept can include the use of technology such as the internet, information systems, software, and hardware to enhance the accessibility and quality of collections, as well as assist in collection management, administration, and services. Smart library is equipped with integrated management systems, online services, RFID technology, and data analysis systems to manage collections with greater effectiveness and efficiency. The concept is characterized by the incorporation of information technology to improve service efficiency and quality for users. Additionally, it includes features such as integrated management systems that simplify the processes of searching and borrowing books as well as provide users with the latest information. Smart library offers online services, enabling users to access different collections (Ganyun et al., 2023). The use of RFID technology facilitates the borrowing and

returning of books and aids in collection management (Enlevi & Masruri, 2023). In this context, smart library incorporates data analysis systems to analyze usage patterns and user interests, which is beneficial for making acquisition and collection management decisions (Daimari et al., 2023). The services can leverage blockchain technology to enhance resource quality, including secure storage, sharing, as well as optimized borrowing and returning systems (Xu & Shang, 2024). In essence, these definitions converge on the idea that the services use information technology to enhance the efficiency and quality of services provided to users.

Problems. Despite the numerous benefits, the implementation of smart library can present several challenges. A significant issue is limited accessibility, where users who are not familiar with technology or lack access may struggle to use the services (Febriyanti et al., 2023; Raihan et al., 2023). This situation leads to unequal access, particularly for disadvantaged communities without adequate technological resources. Another concern is security, since the services rely on information technology, the services are vulnerable to cybersecurity risks, such as cyber-attacks or data theft (Farid et al., 2023; Kont, 2024). Additionally, there is a risk of over-reliance on technology since smart library faces significant challenges due to system failures or technical disruptions. Cost is another major challenge since the implementation and maintenance of technology can be expensive. Managers need to carefully consider the costs to ensure the technology meets the needs and provides significant benefits to users. Finally, smart library often rely on vendors for technology and software supplies. This dependency can become problematic when vendors face issues or unfavorable changes in pricing or policies.

Previous Literature Review. Several research worldwide have been published on smart library. For example, Dan Wang's 2023 research, "Bibliometric analysis and network mapping in Web of Science from 2003 to 2021," examined scientific publications indexed in the Web of Science database from 2003 to 2021. The research aimed to identify global trends on the topic by analyzing the most cited publications, collaborations, keywords, and the latest developments based on reference citations. (Wang, 2023) Another example was "Application of Artificial Intelligence: A Bibliometric Analysis and Visualization of Research Activities" by Prihana Vasishta, Navjyoti Dhingra, and Seema Vasishta, published in 2024. This research conducted a bibliometric analysis of scientific publications on the application of *Artificial Intelligence*, indexed in the Scopus database up to 2022 to enhance the understanding of AI-supported library (Vasishta et al., 2024) Another significant research is "From traditional to emerging technologies: a bibliometric and thematic method from 2013 to 2022" by Asad Ullah Khan et al., published in 2023. This research used a bibliometric analysis of publications from 2013 to 2022 to identify and analyze significant changes, patterns, and trends in publications. (Khan et al., 2023) Additionally, the research "Assessing the digital library research output: bibliometric analysis from 2002 to 2016" by Khurshid Ahmad, Zeng Jian Ming, and Muhammad Rafi, published in 2024, conducted a bibliometric analysis of scientific publications from 2013 to 2022 to understand trends and characteristics of research. (Ahmad et al., 2018) Another relevant example is "Exploring the Landscape of Big Data Applications in Librarianship: A Bibliometric Analysis of Research Trends and Patterns" by Md. Nurul Islam et al., published in 2023. The research conducted a bibliometric analysis using the Scopus database from 2000 to 2022 to analyze trends and patterns in the application of big data and assess the potential impact on the future of library. (Islam et al., 2024)

State of The Art. There are differences between the research above and the research that the author conducted. These differences include the data sources used, data analysis techniques used, the year range used as research objects, and the visualization tools used.

Purpose. Publications by world scientists were discussed as trend in modern library services. Therefore, this research aimed to provide an understanding of the development and trends of scientific publications related to the theme.

II. METHODS

A quantitative paradigm was used with a bibliometric methos. Bibliometrics is a quantitative method that analyzes bibliographic data in journals or articles (Asmawanti S & Soya, 2023). Keyword analysis was adopted (co-word analysis) using the VOSviewer application to process and visualize the data. Meanwhile, publication results were collected, summarized, and analyzed using the keyword from the Scopus database without restricting the publication year. A total of 347 relevant articles were identified as the research population. The main research topics were summarized and analyzed with very high relevance to research. In this context, 260 articles were selected as samples to discuss the current state of development practices worldwide. The research was conducted over approximately three months, from January to March 2024.

III. RESULTS AND DISCUSSION

International Publications About Smart Library by Year. The results from the Scopus database identified 347 relevant articles with the title smart library. An in-depth review of the title was carried out to select 260 articles highly relevant to the research. The first scholarly research with the title was published in 2006. The analysis was conducted based on the year of publication, with the data as follows.

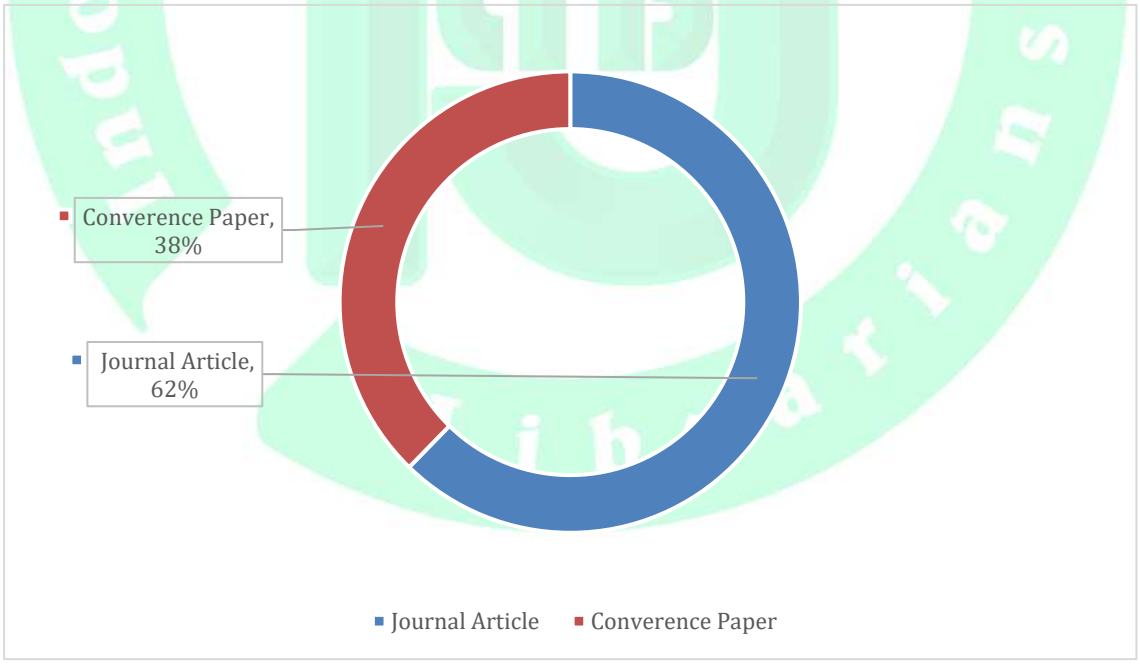
Figure 1.
Year of "Smart Library" International Publication

Source: Scopus Database processed by researchers, 2024

Based on the publication data, there was a clear trend of increasing publication numbers over the years. The first research with the title was published in 2006, focusing on the architectural design of smart library (Buscema et al., 2006). This was followed by research on RFID technology and digital library in 2008 (Kwok et al., 2008) and 2010, respectively (Pan, 2010). Subsequent research explored various themes, including computing concepts, cloud computing, the Internet of Things (IoT), data management, the use of big data, advanced technologies, augmented reality, future trends, and opportunities for development. This included the role of library in smart cities and the use of technology to create interactive learning environments. Meanwhile, the number of publications increased significantly in 2018, with continued growth through 2021 and 2022. The peak of research occurred in 2021 and 2022, with 61 and 58 publications, respectively. This increase was partly driven by the impact of the COVID-19 pandemic since the facilities supported remote research and learning needs. Pambayun's results on research trends during the COVID-19 pandemic showed increased interest (Pambayun, 2021). However, there was a decline in the number of publications in 2023 and 2024, with only 36 and 3 publications, respectively. This decline was attributed to shifting interests and focus areas within the topic in 2023, as well as the limited data collection period in January 2024. Other possible reasons for the decrease included fluctuations in cycles, changes in technology development, external factors such as policy or funding shifts, and potential data anomalies.

International Publication Type. The analysis related to international publication type can be illustrated through Figure 2.

Figure 2.
International Publication Type



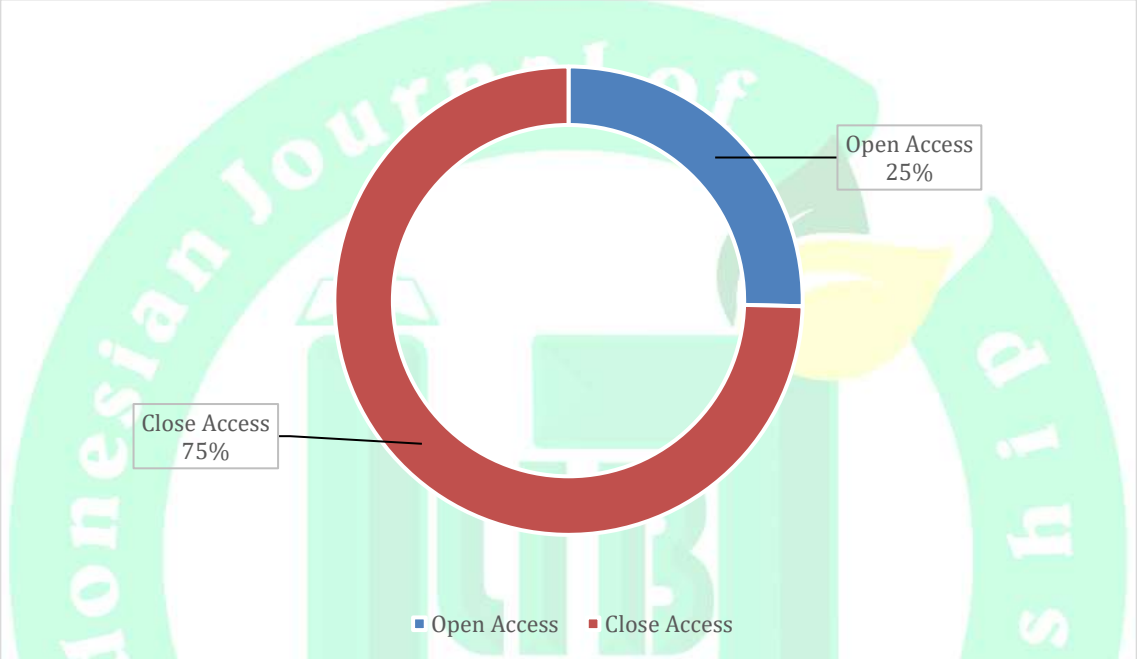
Source: Scopus Database processed by researchers, 2024

The proportion of journal articles (62%) is higher than conference papers (38%). Therefore, research in this field focuses more on the development of theory, methodology, or in-depth results, which are better suited for publication in scholarly journals. In this context, journal articles are subjected to a more rigorous peer review process with higher

publication standards compared to conference papers. The higher proportion shows that smart library research is more focused on in-depth, high-quality, and verified research. Conference papers also play a crucial role in expanding knowledge and facilitating information exchange in this field.

Distribution of Access Openness. The analysis related to distribution of access openness can be illustrated through Figure 3.

Figure 3.
Accesible International Journal



Source: Scopus Database processed by researchers, 2024

Research is facing numerous challenges regarding information accessibility, but ongoing efforts to enhance open access through publications remain a crucial step in expanding knowledge distribution. The higher proportion of close-access publications, which constitutes 75% of the total, suggests that a significant majority of research outputs are not freely available to the general public. This limited accessibility is often a result of publisher or institutional policies that restrict access to publications, typically placing them behind paywalls. Such barriers can impede the flow of knowledge, restricting the ability of researchers, practitioners, and the general public to access and benefit from the latest scientific findings.

The presence of open-access publications, which account for 25% of the total, signifies important efforts to make information more open and accessible to the public. Open-access initiatives are designed to break down the barriers to information, ensuring that research findings are available to a wider audience without the need for costly subscriptions or one-time fees. This approach not only democratizes access to knowledge but also fosters greater collaboration and innovation by allowing more researchers to build upon each other's work.

Open access has the potential to accelerate scientific discovery, enhance educational opportunities, and support evidence-based decision-making in various sectors. By making research freely available, open-access publications can bridge the gap between different

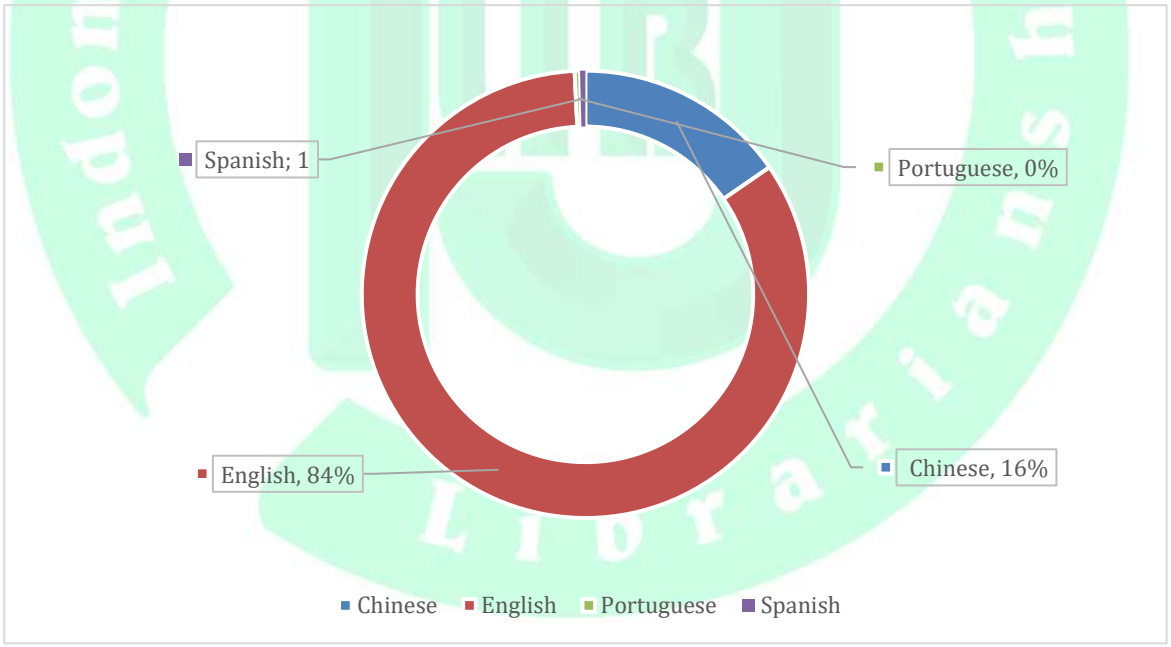
communities, including those in low- and middle-income countries that may not have the financial resources to afford expensive journal subscriptions. Moreover, open access can increase the visibility and impact of research, as studies that are freely accessible are more likely to be read, cited, and utilized by other researchers and practitioners.

Despite these advantages, achieving a higher proportion of open-access publications remains a challenge. Financial constraints, concerns over intellectual property, and the sustainability of open-access business models are some of the issues that need to be addressed. Many publishers rely on subscription fees to cover the costs of peer review, editing, and dissemination, and transitioning to open access requires new funding mechanisms. Additionally, there may be resistance from institutions and researchers accustomed to traditional publishing models.

Finally, while the current landscape shows a predominance of close-access publications, the push towards open access represents a pivotal movement towards more equitable and widespread dissemination of knowledge. Continued efforts to promote open access, alongside the development of sustainable funding and policy frameworks, are essential to overcoming the challenges of information accessibility and ensuring that the benefits of research are shared globally.

International Publication Language. The analysis related to international publication language can be illustrated through Figure 4.

Figure 4.
International Publication Language



Source: Scopus Database processed by researchers, 2024

English dominates as the primary language in publications, with a significantly higher number compared to others. This trend underscores English's role as the dominant language in scientific communication and knowledge dissemination. The prevalence of English-language publications facilitates global access to research findings and allows for broader collaboration among scientists worldwide.

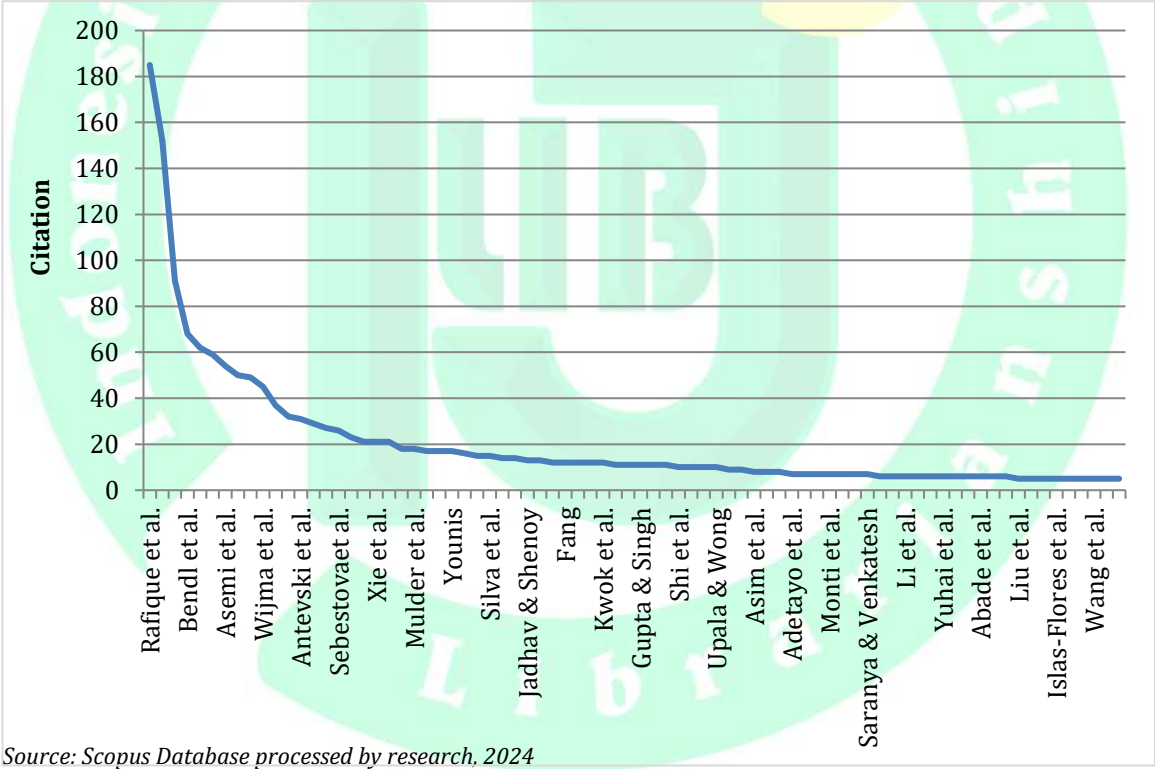
However, the presence of publications in Chinese, Portuguese, and Spanish indicates ongoing efforts towards the internationalization of research on smart libraries. These

publications reflect the growing contributions from non-English-speaking countries and highlight the importance of linguistic diversity in academia. Despite these efforts, the relatively limited number of publications in these languages suggests that access to knowledge can be more restricted for those who are not proficient in English.

This linguistic barrier can hinder the dissemination of research findings and limit the engagement of non-English-speaking scholars in the global scientific community. Therefore, it is crucial to emphasize the importance of translating publications into widely used languages. By doing so, we can expand knowledge distribution, foster inclusive academic discourse, and enhance the global exchange of ideas. The translation of scientific works not only promotes linguistic diversity but also ensures that valuable research reaches a broader audience, ultimately contributing to the advancement of knowledge across different linguistic and cultural contexts.

Citation and Communication between Authors. The analysis related to citation and communication between authors can be illustrated through Figure 5 and 6.

Figure 5.
Total of Citation per Authors

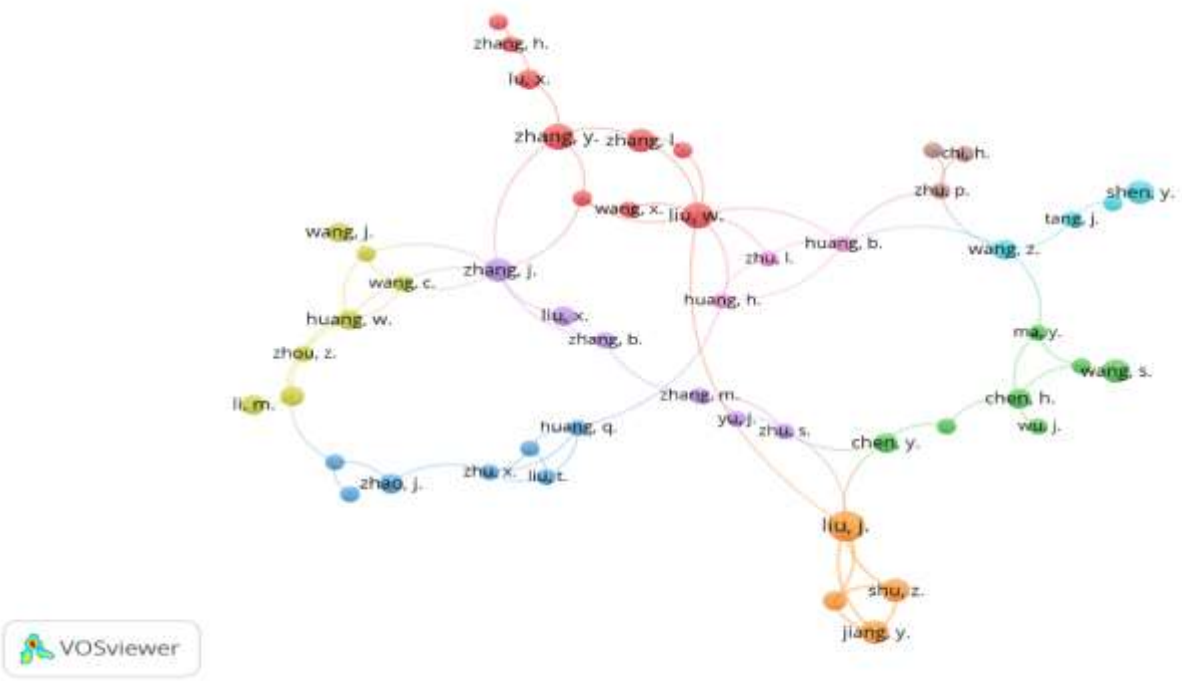


Source: Scopus Database processed by research, 2024

Figure 5 presents an overview of the extent to which the works of these articles are cited in the field of smart library research. This serves as an indicator of the success and impact of scientific contributions within the academic community. Research that show the highest number of citations are Rafique et al., Sumbalova et al., and Jeschek et al. with 185, 152, and 91 citations, showing that the works have a significant impact. Xu, Chen & Hao, and Li et al. with 6 citations have not gained widespread attention from the scientific community. From the data, variations in citation numbers are observed where Simović et al. and Mulder et al. have only 49 and 23 citations, respectively. Additionally, some research

have the same number of citations, such as Liang & Chen, Mulder et al., and Min with 17, 18, and 11 citations, suggesting that the works have comparable levels of influence.

Figure 6.
Map of Academic Communication



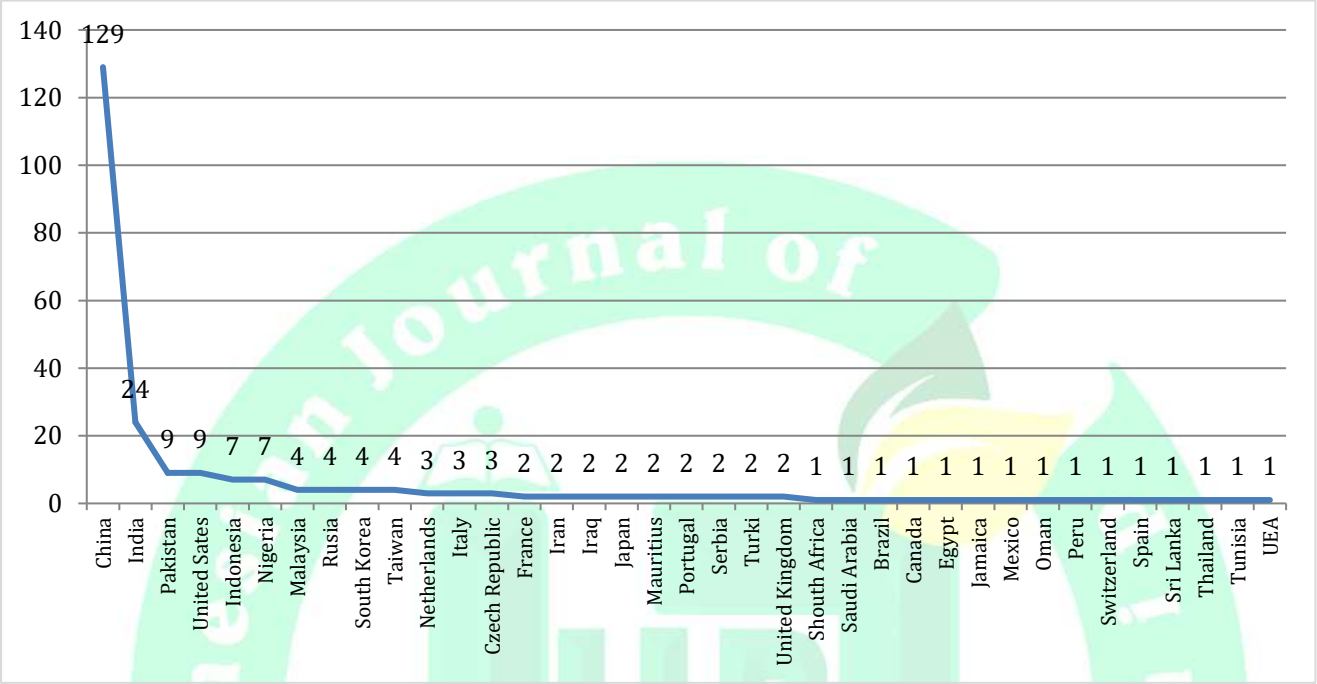
Source: Scopus Database processed with VOS Viewer, 2024

As depicted in Figure 6, there has been effective academic communication in the field of smart libraries between researchers such as Liu W and Liu I, as well as Zhang W and Zhang I. This is evidenced by the citations of their articles within the Scopus database, indicating a reciprocal exchange of scientific insights in subsequent publications. Such interactions suggest a dynamic scholarly dialogue where ideas are continuously being built upon and refined. The impact of this scientific communication extends beyond the immediate circle of these researchers. Other studies have also cited relevant articles within the Scopus database, further demonstrating the reach and influence of this body of work. This network of citations is crucial for the advancement of the smart library field, as it facilitates the dissemination of innovative concepts and practices, contributing to the overall development of the discipline.

Although the total citation counts for articles from China are not as high as those for works by Rafique et al., Sumbalova et al., and Jeschek et al., the Chinese contributions show a robust level of scientific communication. This suggests that while the volume of citations may not be as extensive, the quality and relevance of the research are significant. The active participation of Chinese researchers in the global discourse on smart libraries highlights their contributions to the internationalization of this field. Their work adds valuable perspectives and insights, enriching the collective understanding of smart library systems and technologies. This international collaboration and exchange are essential for addressing global challenges and advancing the implementation of smart libraries worldwide.

Productivity by Country of Origin. The analysis related to productivity by country of origin can be illustrated through Figure 7.

Figure 7.
Year of "Smart Library" International Publication

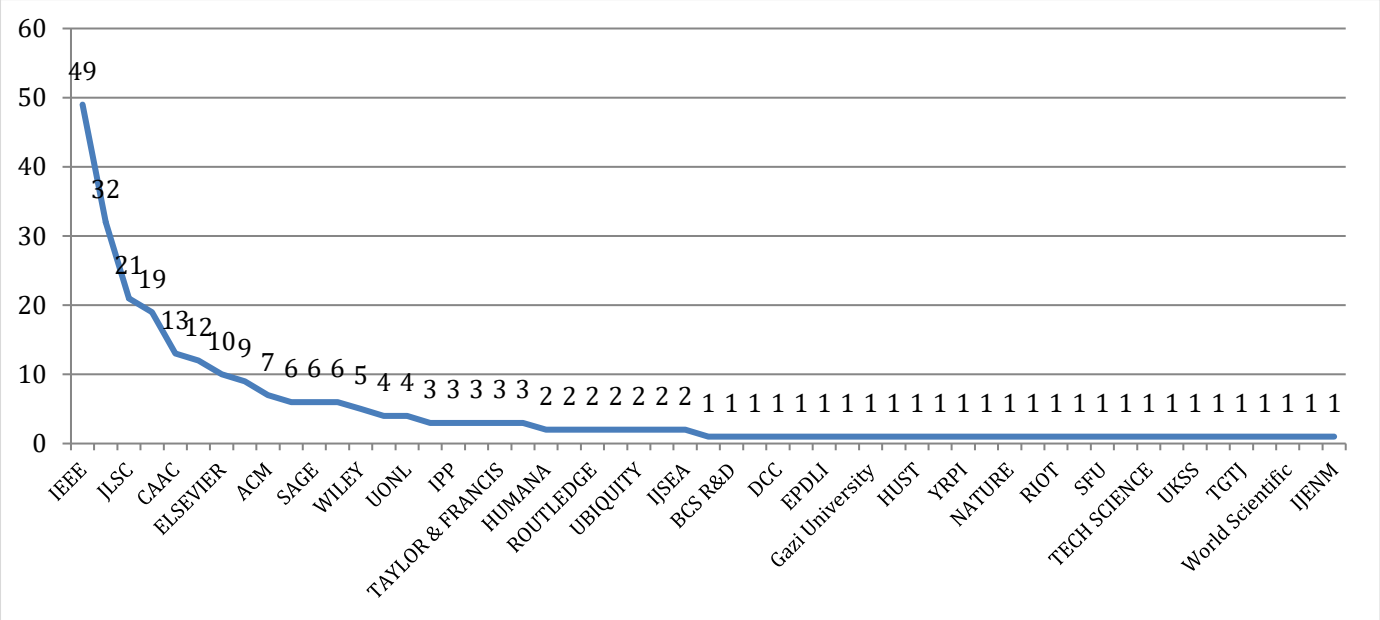


Source: Scopus Database processed by researchers, 2024

Figure 7 shows that China dominates the number of publications in the Scopus database, with 129 (50%) of the total. This is significantly higher than other countries, reflecting the country's strong commitment and investment in information technology development. India shows a significant number of publications despite the large population and status as an IT hub but below China. Countries such as Pakistan, Indonesia, and Malaysia have relatively low publication counts, possibly showing lower levels of focus and investment. The United States has a relatively low number of publications, possibly due to a broader focus on IT development. Meanwhile, Nigeria, Russia, South Korea, and Taiwan show similar interest and potential, with relatively balanced publication numbers. Other countries have fewer publications, showing varying levels of interest and focus in the development. The analysis provides insight into the differences and similarities in the focus of the development across various countries, which can serve as a basis for understanding trends and potential collaborations

Source of International Journal/Proceeding Publications. The analysis related to source of international publication can be illustrated through Figure 8.

Figure 8.
Source of International Journal/Proceeding Publications

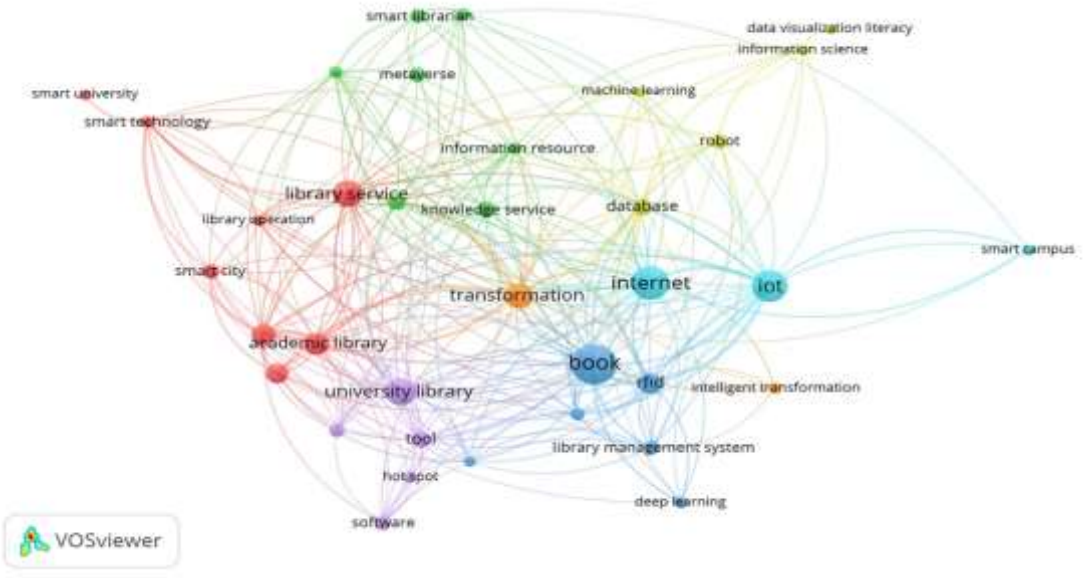


Source: Scopus Database processed by researchers, 2024

Based on Figure 8, 55 publishers have published articles titled smart library and an analysis was conducted to provide an overview of the distribution. Therefore, the Institute of Electrical and Electronics Engineers Inc. (IEEE) is the leading publisher with 49 articles. Other active publishers include Emerald Publishing, Journal of Library Science China (JLSC), and Springer with 32, 21, and 19 articles, respectively. Even though the topic attracts interest from various publishers, there is an imbalance in the distribution of publications among these publishers. This analysis serves as a basis for practitioners in selecting sources of information and for further development.

Map of Article Theme Based on Title and Abstract Analysis. The analysis related to map of article theme can be illustrated through Figure 9.

Figure 9.
Theme Mapping



Source: Scopus Database processed with VOS Viewer, 2024

The most frequently mentioned topics include books, internet, Internet of Things (IoT), university library, library services, transformation, academic library, RFID, smart services, and public library. This is consistent with Khan et al., where the frequent occurrence of terms related to technology significantly influences the development of the topic. Moreover, smart library uses new technologies to create, organize, preserve, distribute, access, and use information, as well as to deliver services. The adoption of these technologies has shifted the paradigm, enabling faster, more efficient, and smarter services. This is evidenced by extended operational hours and the ability to provide services without being bound by physical location (Khan et al., 2023).

Mandel et al. argued that the integration of big data components was necessary to enable more active and enhanced services. According to Johnson, the technical expertise of professional librarians remains crucial and relevant in the era of big data. Leung et al. reported that the Covid-19 pandemic increased technological adaptation. The presence of big data plays an important role, enabling library to better meet the evolving needs of users. (Islam et al., 2024) Additionally, Ming-yueh Tsay's research reported that databases, software, and web portals enhanced services and information, thereby transforming the environment (Ahmad et al., 2018).

In this context, librarians should keep up with advancements in technology, particularly in the field of big data. The role includes creativity and innovation to obtain new methods of making data or information more accessible and understandable. Moreover, librarians must remain informed about developments in big data, AI, IoT, and other technological innovations to create better and more modern library. (Vasishta et al., 2024) Liang and Chen suggested that IoT could improve public services through Radio Frequency Identification (RFID) and near-field communication. These technologies facilitated automatic identification and tracking, such as self-checkout, self-return, locating misplaced books, and inventory management (Wang, 2023).

Discussion of Research Findings. The most frequently emerging research topic is the internet and things related to it. This shows that the research results from the more recent year have progressed compared to the research produced by Ahmad et al., 2018, namely that the title that has become a trending research topic is electronic libraries. The most productive publication was in 2016 with rapid publication growth. The country that dominates the research results the most is the United States with its affiliation with the University of Illinois. The most productive writer is Fourie I who comes from South Africa. the most frequently cited type of document is an article.

Furthermore, research conducted by Vasishta et al., 2024 regarding libraries that use Artificial Intelligence has been carried out over the last three years, but has not been carried out in depth. Therefore, it is necessary to carry out in-depth studies regarding Artificial Intelligence related to libraries, such as in the fields of data mining and library big data. This is proven by research conducted by researchers that the topics that have become a trend in the field of smart libraries over the last 75 years have not been much about Artificial Intelligence, but have been related to the internet.

Research conducted by Khan et al., 2023 shows that research trends regarding technology that supports smart libraries consist of information retrieval, personalized recommendations, intelligent data analytics, connected library spaces, real-time information access, augmented reality/virtual reality applications in libraries and

strategies, digital literacy and inclusiveness. This is related to the results of research conducted by researchers, namely the internet, Internet of Things (IOT), and library transformation.

Research conducted by Wang, 2023 shows that the keyword "mobile library" is the keyword most frequently used in research on smart libraries from 2003-2021 with data sourced from Web of Science. This is closely related to the research that researchers conducted, namely the keyword that is trending is internet. The internet is closely related to mobile or applications, in this case mobile libraries.

Research conducted by Islam et al., 2024 shows that big data in librarianship has developed rapidly in recent years. The most common keywords in the literature are big data, librarianship, data mining, information retrieval, machine learning and webometrics. This is related to keywords that are trending in research conducted by researchers, namely the internet. The internet is closely related to big data, librarianship, data mining, information retrieval, machine learning and webometrics.

IV. CONCLUTION

In conclusion, the most frequently occurring keywords in the research were "book," "internet," "IoT," "university library," "library service," "transformation," "academic library," "RFID," "smart service," and "public library." These keywords highlight the primary focus areas of the research, emphasizing the integration of information technology into library services and the ongoing transformation towards more intelligent and efficient library systems. The research underscores the pivotal role of advanced technologies like IoT and RFID in modernizing library operations, enhancing service delivery, and improving user experiences.

Furthermore, the studies explored how university and public libraries are adapting to these technological changes, reflecting a broader trend towards the digitization and smart management of information resources. The recommendations derived from this body of research strongly advocate for continued investment in information technology, recognizing that the concept of a smart library is dynamic and evolves with advancements in existing technologies. Embracing these innovations is essential for libraries to remain relevant and capable of meeting the changing needs of their users. Therefore, future research and development should focus on leveraging new technologies to further enhance library services and contribute to the ongoing transformation of library environments into smarter, more efficient, and user-centric spaces.

V. ACKNOWLEDGMENTS

The authors are deeply grateful to all those who have contributed to this project, providing valuable support and guidance. It is important to note that the authors have no conflict of interest regarding this research. The findings presented here are based solely on objective analysis, free from personal or financial biases.

VI. REFERENCES

Ahmad, K., Jian Ming, Z., & Rafi, M. (2018). Assessing the digital library research output: bibliometric analysis from 2002 to 2016. *The Electronic Library*, *36*(4), 696–704. https://doi.org/10.1108/EL-02-2017-0036

Aittola, M., Ryhänen, T., & Ojala, T. (2003). SmartLibrary–location-aware mobile library service. *Human-Computer Interaction with Mobile Devices and Services: 5th International Symposium, Mobile HCI 2003, Udine, Italy, September 2003. Proceedings 5*, 411–416. http://dx.doi.org/10.1007/978-3-540-45233-1_38

Asmawanti S, D., & Soya, M. (2023). Bibliometric Analysis of Good Government Governance in Indonesia from 2015-2020. *Monex – Journal of Accounting Research*, *12*(01), 21–38. https://ejournal.poltektegal.ac.id/index.php/monex/article/view/3760/2248

Barsha, S., & Munshi, S. A. (2024). Implementing artificial intelligence in library services: A review of current prospects and challenges of developing countries. *Library Hi Tech News*, *41*(1), 7–10. http://dx.doi.org/10.1108/LHTN-07-2023-0126

Buscema, M., Terzi, S., Maurelli, G., Capriotti, M., & Carlei, V. (2006). The smart library architecture of an orientation portal. *Quality and Quantity*, *40*(6), 911–933. https://doi.org/10.1007/s11135-005-1081-x

Daimari, D., Mondal, S., Brahma, B., & Nag, A. (2023). FAVORITE BOOK PREDICTION SYSTEM USING MACHINE LEARNING ALGORITHMS. *Journal of Applied Engineering and Technological Science*, *4*(2), 983–991. https://doi.org/10.37385/jaets.v4i2.1925

Enlevi, S., & Masruri, A. (2023). SMART LIBRARY Antara Kontestasi Atau Kolaborasi Dengan Google Dalam Menghadapi Digital Native. *Jurnal Ilmu Perpustakaan (JIPER)*, *5*(1), 97–110. https://journal.ummat.ac.id/index.php/JIPER/article/view/14374

Farid, G., Warraich, N. F., & Iftikhar, S. (2023). Digital information security management policy in academic library: A systematic review (2010–2022). *Journal of Information Science*, 01655515231160026. http://dx.doi.org/10.1177/01655515231160026

Febriyanti, R. A., Nurtino, T., Huzaifah, M. L., & Kusumawardhani, D. A. R. (2023). Information Technology Development's Impact On Library Services. *International Transactions on Education Technology*, *2*(1), 24–30. https://doi.org/10.33050/itee.v2i1.397

Ganyun, A. H., Kristina, K., & Ndaumanu, R. I. (2023). APLIKASI SMART LIBRARY BERBASIS ANDROID. *MASITIKA*, *8*.

Garnar, M., & Tonyan, J. (2021). Library as place: Understanding contradicting user expectations. *The Journal of Academic Librarianship*, *47*(5), 102391. http://dx.doi.org/10.1016/j.acalib.2021.102391

Higgins, S., & King, M. L. (2013). Access to Digital Library for Disadvantaged Users. *Library Philosophy & Practice*.

Islam, Md. N., Hu, G., Ashiq, M., & Ahmad, S. (2024). Exploring the landscape of big data applications in librarianship: a bibliometric analysis of research trends and patterns. *Library Hi Tech*. https://doi.org/10.1108/LHT-05-2023-0193

Khan, A. U., Ma, Z., Li, M., Zhi, L., Hu, W., & Yang, X. (2023). From traditional to emerging technologies in supporting smart library. A bibliometric and thematic approach from 2013 to 2022. *Library Hi Tech*. https://doi.org/10.1108/LHT-07-2023-0280

Kont, K.-R. (2024). Library and cyber security: the importance of the human factor in preventing cyber attacks. *Library Hi Tech News*, *41*(1), 11–15. https://doi.org/10.1108/LHTN-03-2023-0036

Kwok, S. K., Cheung, C. F., Lee, W. B., Tsang, A. H. C., & Tang, M. C. (2008). Development of an RFID-enabled mobile smart library system. *International Journal of Enterprise Network Management*, *2*(2), 185–197. https://doi.org/10.1504/IJENM.2008.016598

Li, T., Tang, J., Xiao, L., & Cai, M. (2021). Evaluation of Smart Library Portal Website Based on Link Analysis. *Procedia CIRP*, *188*, 114–120. https://doi.org/10.1016/j.procs.2021.05.059

Mehta, D. (2020). COVID-19 and digital library services – a case study of a university library. *Digital Library Perspectives*, *36*(4), 351–363. https://doi.org/10.1108/DLP-05-2020-0030

Pambayun, K. G. (2021). Digital Library during Covid-19 Pandemic: A Bibliometric Analysis and Information Mapping. *Indonesian Journal of Librarianship*, *2*(1), 17–30. https://doi.org/10.33701/IJOLIB.V2I1.1416

Pan, Y.-H. (2010). Important developments for the digital library: Data ocean and smart library. *Journal of Zhejiang University: Science C*, *11*(11), 835–836. https://doi.org/10.1631/jzus.C1001000

Pawley, C. (2017). Library: Meaning and use. *American Literary History*, *29*(1), 156–165. https://doi.org/10.1093/alh/ajw059

Rafiq, M., Batool, S. H., Ali, A. F., & Ullah, M. (2021). University library response to COVID-19 pandemic: A developing country perspective. *The Journal of Academic Librarianship*, *47*(1), 102280. https://doi.org/10.1016/j.acalib.2020.102280

Raihan, M., Anwar, R. K., Amar, S. C. D., & Rukmana, E. N. (2023). Penelitian Terhadap Pustakawan Dalam Memanajemen Koleksi Di Perpustakaan Digital: Narrative Literature Review. *VISI PUSTAKA: Buletin Jaringan Informasi Antar Perpustakaan*, *25*(3).

Rangel, J. C., & Humphrey-Murto, S. (2024). Social Studies of Science and Technology: New ways to illuminate challenges in training for health information technologies utilisation. *Medical Education*, *58*(1), 27–35. http://dx.doi.org/10.1111/medu.15179

Ternenge, T. S., Dorcas, T. N., & Terwase, A. C. (2020). Perceived Impact of Online Public Access Catalogue (OPAC) On effective retrieval of information resources by postgraduate students in Benue State University, Makurdi. *Journal La Edusci*, *1*(6), 25–36. http://dx.doi.org/10.37899/journallaedusci.v1i6.250

Vasishta, P., Dhingra, N., & Vasishta, S. (2024). Application of artificial intelligence: a bibliometric analysis and visualisation of research activities. *Library Hi Tech*. https://doi.org/10.1108/LHT-12-2023-0589

Wang, D. (2023). Bibliometric analyses and network mapping on the smart library in Web of Science from 2003 to 2021. *Hi Tech*. https://doi.org/10.1108/LHT-08-2022-0361

Winata, A. P. (2021). New normal and services in Indonesia: a case study of university library. *Digital Library Perspectives*, *37*(1), 77–84. https://doi.org/10.1108/DLP-07-2020-0059

Xu, X., & Shang, J. (2024). Research on the construction scheme of smart library based on blockchain technology. *Measurement: Sensors*, *31*. https://doi.org/10.1016/j.measen.2023.100943