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Science Mapping of Library and Information Science (LIS) and Library Technology Studies in Indonesia

Kamaludin[1], Abdurachman Prasetyadi[2]

[1] Kepustakaan BRIN Multi Satker Bandung – Direktorat Repositori, MultiMedia dan Penerbitan Ilmiah – Badan Riset dan Inovasi Nasional
[2]Pusat Riset Sains Data dan Informasi - Badan Riset dan Inovasi Nasional

Email: [1]kamaludin1961@gmail.com; [2]abdurrakhmanpras@gmail.com

ABSTRACT

This study aims to map the knowledge of the Library and Information Science (LIS) study and its technology in Indonesia. Data were obtained from the Scopus database by entering keywords in the title: library; library science; technology libraries; *and* Indonesia, *during 1974-2022 and received 87 documents. The method used was bibliometric, with Bibliometric and CiteSpace software. The results showed that the annual growth of LIS studies in Indonesia was still relatively low at 3.41%, and the highest average citations occurred in 2013. Indonesia dominated authors with the highest citations, and the most relevant sources were dominated by proceedings showing that the LIS study was still in its infancy, a less scientific research stage. Most cited journal articles in references. Indonesia was the country with the most frequency of collaboration, namely 21 collaborations. The keyword* library *was the most commonly used 349 times, then the technical terms that emerged included* information system *(5%),* search engine *(2%),* automation, and big data, *respectively (1%). Cluster #0 public library was the largest, and this cluster includes a* smart public library, smart library, and smart environment *in its cluster members.*

Keywords: *LIS, library technology; bibliometrics; cluster; knowledge; public library.*

ABSTRAK

Studi ini bertujuan untuk memetakan pengetahuan studi *Library and Information Scince* (LIS) dan teknologinya di Indonesia. Data diperoleh dari database Scopus dengan memasukkan kata kunci pada judul: library; library science; library technology; dan Indonesia, selama periode 1974-2022 dan diperoleh 87 dokumen. Metode yang digunakan bibliometrik, dengan software Bibliometrix dan CiteSpace. Hasil studi menunjukkan pertumbuhan studi tahunan LIS di Indonesia masih cukup rendah 3,41% dan rata-rata sitasi tertinggi terjadi di 2013. Penulis dengan sitasi tertinggi didominasi berasal dari Indonesia, dan sumber yang paling relevan didominasi berasal dari prosiding yang menunjukkan studi LIS masih dalam tahap penelitian yang kurang ilmiah. Artikel jurnal paling banyak disitasi dalam referensi. Indonesia merupakan negara dengan frekuensi kolaborasi terbanyak yakni 21 kolaborasi. Kata kunci *library* menjadi yang paling umum digunakan sebanyak 349 kali, kemudian istilah teknis yang muncul diantaranya *information system* (5%), *search engine* (2%), *automation* dan *big data* masing-masing (1%). Klaster #0 *public library* merupakan yang terbesar, klaster ini mencakup *smart public library, smart library,* dan *smart environment* dalam anggota klasternya.

Kata kunci: *LIS*; teknologi perpustakaan; bibliometric; kluster; pengetahuan; perpustakaan umum.

A. INTRODUCTION

The development of science and technology has a positive impact on human life, with applying science and technology, human activities will be more accessible. In library services, the

benefits of science and technology include accelerating and facilitating the process of storing, searching, and disseminating information.

Globalization and innovative digital communication technologies have fundamentally changed the way people interact with each other (Skarpa & Garoufallou, 2022). Journals are a way of scientifically communicating and interacting in an academic environment. The primary journal is the essential scientific communication channel. It reflects crucial issues for the field of study and the profession. Papers published in primary journals indicate the growth of literature in a particular lot of knowledge and make it easier to conduct an in-depth analysis of a discipline as a whole (Garg & Singh, 2022).

Scientific publications are used for promotion, tenure, benchmarking, recruitment activities, grant applications, and careers (Hobbs & Hobbs, 2017). Likewise, conference publications can be activated for the complete dissemination of details, and conference presenters are encouraged to share their work more widely through full-text publication (Hinrichs et al., 2021).

Library and Information Science (LIS) helps to know how this work has been shared through publications, what topics have been covered, and how this work has been incorporated into LIS practice (Jones et al., 2022). Measuring the publication can be done by using bibliometric analysis. Bibliometric analysis can be used at various levels, such as countries, institutions, authors, and journals. It can also identify collaborative patterns among different actors, such as countries, institutions, and writers. Various publishers publish many primary journals in library and information science (LIS) disciplines from other parts of the world (Garg & Singh, 2022).

Previous studies on LIS and library technology have been carried out using bibliometrics. Junandi, in his study, showed that single authors dominated LIS publications with a degree of collaboration of only 0.67, the majority of references used were books, and female authors were more productive (Junandi, 2018). Rahayu and Tupan also showed single authors dominated the same thing, LIS publications in Agricultural Library journals, and the references used came from within the country (Nani, 2022). In another study, Dwiyantoro showed in his research that LIS publications tend to be in 3 main taxonomies, including Libraries and Library Services (LIS), Information Professional, and Information Science Research (ISR) (Dwiyantoro, 2020).

B. PROBLEM STATEMENT

Based on the background above, there were several problems; namely, previous studies only tended to discuss collaboration metrics and study topic trends. There was no comprehensive or

overall measure of LIS and library technology publications in Indonesia yet. Such as study growth, citation analysis, collaboration networks between countries/institutions/authors, keyword co-occurrence analysis, and knowledge domain clusters. Therefore, this study aims to analyze LIS publications using bibliometrics comprehensively. Questions from the study are:

1) How is the growth of LIS and library technology studies?
2) What is the citation context in the LIS and library technology studies?
3) What is the collaboration between countries, institutions, and/or authors like?
4) What are the most commonly used/influential keywords?
5) What clusters are dominating and most recent in the LIS and library technology knowledge domain?

C. LITERATURE REVIEW

Libraries will continue to promote the availability of books and other materials, increase efforts to provide information to users, and expand the range of activities offered so that users can receive services using new methods based on computers and telecommunication.

Throughout the collection, there is a marked enthusiasm for the subjects being promoted. Programs for students (from preschool to college) are designed to be fun, stimulating, innovative, and educational, with clearly stated educational outcomes (Fisher, 2015). Since the fundamental role of the academic library is to develop, manage and secure collections, which provide a rapid and high-quality assessment of the information necessary for teaching and study (Novosel, 2009).

Information literacy is one of the efforts of librarians to help and teach users to think critically about what they read, hear and see. Information scientists must become leaders in modern society, given the enormous volume of information. The data quality is crucial as this information is continuously increasing due to advances in information technology. It is essential to empower people with the skills they need to find, evaluate, and use shared information (Skarpa & Garoufallou, 2022).

As the information landscape continues to evolve and the challenges facing librarians multiply, this requires information professionals who are highly innovative and adaptive (Pierce, 2022). For most of its history, libraries have demonstrated their importance to their parent organizations by reading statistics focusing on inputs (investment of resources) and outputs (services produced). This data helps track trends and, sometimes, provides a benchmark for service. The ratio of these two data points can give a better picture of how well a library functions.

Institutional accreditation (certification) standards guide as to what level is acceptable. (Blixrud, 2003). This study looks at how librarians navigate the various challenges arising from rethinking how academic libraries engage with technology and drive solving the problems of library work. (Ellern & Cruz, 2021).

The starting point is the ideal of a friendly and knowledgeable librarian who knows the collection and is intimate with his readers (Buckland, 2017). The unprecedented increase in information resources, methodologies, and modern academic study products has encouraged the library community to explore and create a growing suite of offerings to support optimal information management (Cain et al., 2016). The shift of libraries from book providers to social facilitators and information co-creators (Longmeier, 2021).

This shift has prompted academic study libraries to reassess their information and data management services and solutions. While librarians have a general awareness of the needs of researchers, the profession's work focuses on more traditional outcomes of academic study, for example, literature review, cataloging published works, collection development, analysis of citations, and the like. Today, librarians are actively involved in all stages of the study life cycle and observe first-hand how researchers struggle to manage their various information needs (Cain et al., 2016). Each library has its customer proof and rules (Novosel, 2009).

Library Technology

Libraries are currently demanded to be able to change following the social changes of the users. The development of Information Technology (IT) has changed the social character of the wearer. Changes in information needs, interacting with others, competing, and others. Ultimately, it all comes down to user demands (Sa'diyah; & Adli, 2019). Ability to understand information architecture, navigate complex and voluminous data sets, ability to search for information (Skarpa & Garoufallou, 2022). Advances in information technology that support academics require the expertise and creativity of librarians and information technology professionals (Cain et al., 2016). With the development of information and communication technology, both unique and public libraries are increasingly divided into physical and virtual spaces, between print and screen materials, now having to work with a large amount of documentation. New technologies offer many benefits to these libraries. From the librarian's side, it will be easier to manage collections, circulation, and cataloging (Novosel, 2009).

Many Information Technology (IT) standards and IT practices guide a subset of information technology activities (Setiawan, Ari Kukrnia; Andry, 2019). The IT framework requires a performance measurement matrix as part of the evaluation. For internal organizations, evaluating IT governance helps ensure that IT has provided optimal results and the design development and improvement process. Thus, IT governance always follows technological advances and organizational goals (Irhandayaningsih, 2020). It is necessary to consider the possibility of this fourth industrial revolution era while understanding its benefits for libraries (Lund, 2021). With the advent of the Web, library and information science (LIS) professionals and researchers have solved some of the key challenges and problems regarding description, discovery, and access to library resources. (Asim Ullah, Shah Khusro, 2022).

D. RESEARCH METHODS

The research method used was bibliometric, using Bibliometric and CiteSpace software (Chen et al., 2010). Data were obtained from the Scopus database on November 9, 2022, by entering keywords in the title: library; library science; information science; technology library; Indonesia. Keywords are some of the core words of scientific articles. Keywords should be written referring to terms appropriate to the topic of discussion of scientific papers so that they can help readers understand the contents of scientific articles. Keywords are single words (one syllable) or terms (a combination of several syllables). To choose suitable keywords, pick words or phrases often mentioned and contained in the title, abstract, or content of scientific articles. (Jatmiko et al., 2015).

Based on the methodological procedures used, this study carried out four steps: the first step is that the article is searched in the Scopus, the time range and type of documents is not specified, and uses the Boolean operator "OR" and “AND.” Articles searched in the article title with the following query ((TITLE (library) OR TITLE (library AND science) OR TITLE (information AND science) OR TITLE (library AND technology) AND TITLE (Indonesia))). This search returned 91 results, starting in 1974 and ending in 2022

In the second stage, export data from Scopus by selecting all the information needed and exporting it to BibTeX and RIS formats. Next, in the third step, this study conducted data processing in Bibliometrix and CiteSpace Software as follows: 1) citation analysis, 2) collaboration network analysis, 3) keyword co-occurrence analysis and 4) identifying knowledge clusters. All data obtained is used, and no sorting is carried out because no data is duplicated or missing.

In the fourth step, this research interprets and discusses the results in the third step to identify the main research trends and gaps in this field.

E. RESULTS AND DISCUSSION

This section describes the growth of LIS and library technology studies, citation analysis, the collaboration of countries/institutions/authors, keyword co-occurrence analysis, and knowledge cluster identification.

1. Study Growth

The growth of the LIS and library technology annual studied in the 1974-2022 period was 3.41%, still relatively low compared to the average growth of modern studies, according to (Bornmann & Mutz, 2015), which is 7-8%. The first significant increase occurred in 2018 (11%), and the most significant decrease occurred in 2019 (-9.57%), so the growth in this study forms a fluctuating trend line (up and down). 2021 was the most productive year with 21 documents, followed by 2018 with 17 papers and 2020 with 13 documents.

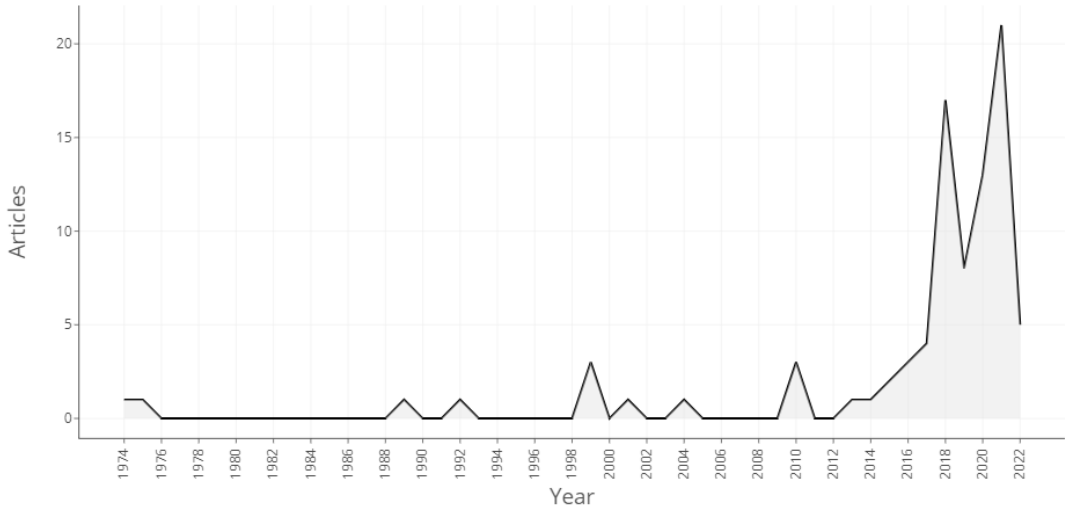

Figure 1. The growth of LIS and library technology studies in Indonesia
Source: data processed at Bibliometrix

There are seven institutions from Indonesia which responsible for the majority LIS publications and library technology in Indonesia, including Univ Indonesia with 30 publications, National Research and Innovation Agency (13), Univ Airlangga (10), Bandung Institute of Technology (9), Syarif Hidayatullah State Islamic University (8), Bina Nusantara (7), Sebelas Maret University (7), University of Kristen Petra (7), LIPI (6), and Diponegoro University (5).

Then, 10 Indonesian authors are responsible for most LIS publications and library technology in Indonesia. Among them is Oetari with six publications, Sjamsuridzal (6), Srirahayu (5), Anna, Harisanty, Katarina, Nurdiani, Nurdin, Rachmania, and Rahmadewi, each with four publications.

2. Citation Analysis

Table 1 explains that 2013 was the year with the highest average citations of 5.67 citations per year from just one publication, in contrast to 2021, which only had an average citation per year of 0.67 from 21 documents.

Table 1. Average citations per year

Year	N	MeanTCperArt	MeanTCperYear	CitableYears
2013	1	51,00	5,67	9
2014	1	1,00	0,13	8
2015	2	11,00	1,57	7
2016	3	3,00	0,50	6
2017	4	7,75	1,55	5
2018	17	2,53	0,63	4
2019	8	1,13	0,38	3
2020	13	3,46	1,73	2
2021	21	0,67	0,67	1
2022	5	0,00		0

Source: data processed at Bibliometrix

Then Table 2 shows the ten most relevant sources, where Libray Philosophy and Practice was the source with the highest number of citations (24). Meanwhile, sources from proceedings dominate the most relevant authorities, indicating that LIS publications in Indonesia were still at the initial study stage and were not in-depth. As stated by LPPM UMA, the scientific level of proceedings was below journal articles because the proceedings selection process was not as strict as journal articles (Adminlp2m, 2021).

Table 2. Ten most relevant sources

Source	h_index	g_index	m_index	TC	NP	PY_start
Library Philosophy and Practice	3	3	0,231	24	24	2010
2017 5th International Conference on Cyber and it Service Management, Citsm 2017	2	2	0,333	9	2	2017
Aip Conference Proceedings	2	2	0,286	8	5	2016
Education for Information	2	2	0,083	5	2	1999
Journal of Theoretical and Applied Information Technology	2	2	0,25	22	2	2015
Library Management	2	3	0,2	73	3	2013
2015 International Conference on Information Technology Systems and Innovation, Icitsi 2015 - Proceedings	1	1	0,143	2	1	2016
2016 13th International Joint Conference on Computer Science and Software Engineering, Jcsse 2016	1	1	0,143	2	1	2016
2016 International Workshop on Big Data and Information Security, Iwbis 2016	1	1	0,167	2	1	2017
2017 International Conference on Advanced Computer Science and Information Systems, Icacsis 2017	1	1	0,2	1	1	2018

Source: data processed at Bibliometrix

Table 3 shows the ten most relevant authors, with Anna with the highest number of citations (11). The ten most relevant writers were predominantly from Indonesia. According to Rahayu and Tupan, many LIS writers were from within the country (Nani, 2022). These results indicated that the subject of the LIS study in Indonesia had not received much interest or had been carried out by authors from abroad.

Table 3. The ten most relevant authors

Author	h_index	g_index	m_index	TC	NP	PY_start
Anna	2	3	0,154	11	4	2010
Basuki	2	2	0,25	31	2	2015
Fitri	2	2	0,286	8	3	2016
Maryati	2	2	0,4	9	2	2018
Oetari	2	2	0,286	8	6	2016
Purwandari	2	2	0,4	9	2	2018
Rachmania	2	2	0,286	7	4	2016
Sjamsuridzal	2	2	0,286	8	6	2016
Srirahayu	2	3	0,4	11	5	2018
Susetyo-Salim	2	2	0,286	8	4	2016

Source: data processed at Bibliometrix

The document with the highest impact was entitled "An analysis of library customer loyalty: The role of service quality and customer satisfaction, a case study in Indonesia" by Bakti and Sumaedi, with 51 citations. Journal articles dominate the ten documents with the highest impact, indicating journal articles most cited in references. In contrast, Junandi states that book references were the most widely used (Junandi, 2018).

Table 4. Ten documents with the highest citation impact

Paper	Total Citations	TC per Year	Normalized TC
Bakti dan Sumaedi, 2013, Libr Manage	51	5,10	1,00
Divayana Dgh, 2017, j Theor Appl Inf Technol	20	3,33	2,58
Farida i, 2015, Libr Manage	20	2,50	1,82
Ng w, 2020, Geoderma Reg	16	5,33	4,62
Limmon g, 2020, Ecology And Evolution	16	5,33	4,62
Winata Ap, 2021, Digit Library Perspect	11	5,50	16,50
Limanto a, 2017, Int Conf Cyber It Serv Manag , Citsm	7	1,17	0,90
Maryati i, 2018, Acm Int Conf Proc Ser	6	1,20	2,37
Rahmawati r, 2018, Biodiversitas	6	1,20	2,37
Putra Sj, 2018, Indones j Electrical Eng Comput Sci	5	1,00	1,98

Source: data processed at Bibliometrix

3. Collaboration Network Analysis

Figure 2 illustrates the author's collaboration network generated by the Bibliometrix software, forming several small clusters of scattered collaboration networks. The spread of collaboration networks showed that the collaboration topics in the LIS study were varied or broad in scope. The nodes (circles) in the network represent one author, while the links (lines) represent collaborations by authors. In the largest cluster (cluster 7), Sjamsuridzal was the center of a collaborative network with a closeness value of 0.2. Sri Rahayu was the author with the most collaborations (13), followed by Anna (10). The size of the nodes described the frequency of collaborations that the author did.

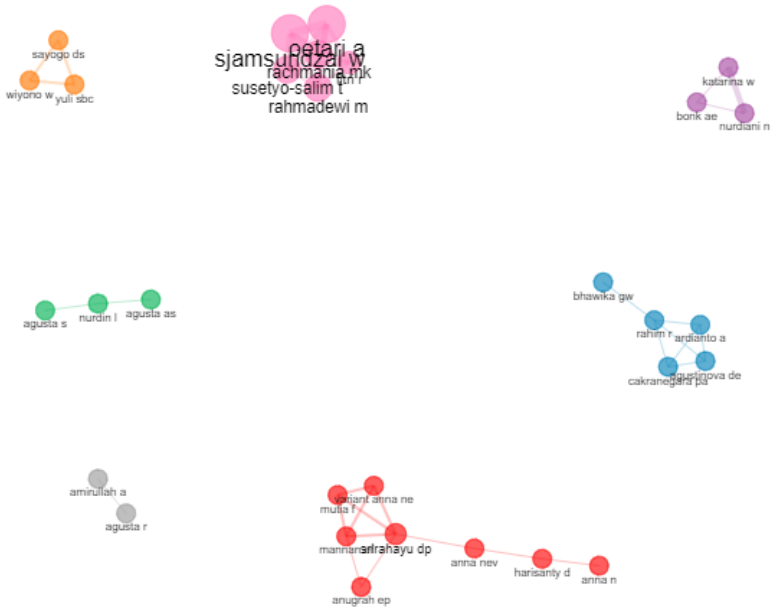

Figure 2. Author collaboration network
Source: data processed at Bibliometrix

Figure 3 illustrates that Indonesia had the highest collaboration frequency (21). In addition, Indonesia was the network center for the largest cluster (cluster 1) with Malaysia, the USA, Australia, and Thailand. These results indicated that writers from Indonesia were often the main contributors, along with writers from other countries.

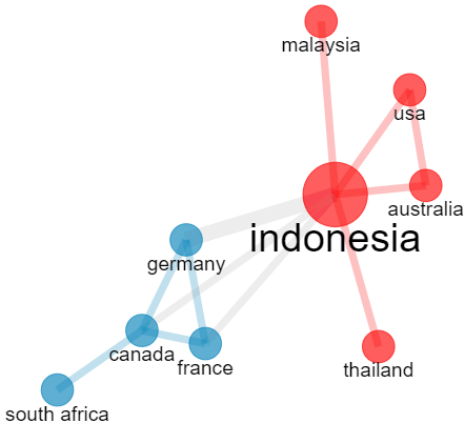

Figure 3. Country collaboration network
Source: data processed at Bibliometrix

4. Keyword Co-occurrence Analysis

The keyword library was the most commonly used 349 times, followed by Indonesia 147 and libraries 128. At the same time, the technical terms used in this study included information systems (5%), search engines (2%), automation, and big data (1%).

Figure 4 illustrates the co-occurrence network generated by Bibliometrix with 50 nodes and 149 links. Each node in the network represented one keyword, and the line represented the link for the word's occurrence in the same document (co-occurrence). The size of the node describes the frequency with which the keyword appears.

Table 5 explains the six most influential keywords (strength) where the public library had the highest strength value, 2.17, which was the trending topic for 2020-2022. In addition, information system and information system library were keywords with the most extended trending duration in LIS studies in Indonesia.

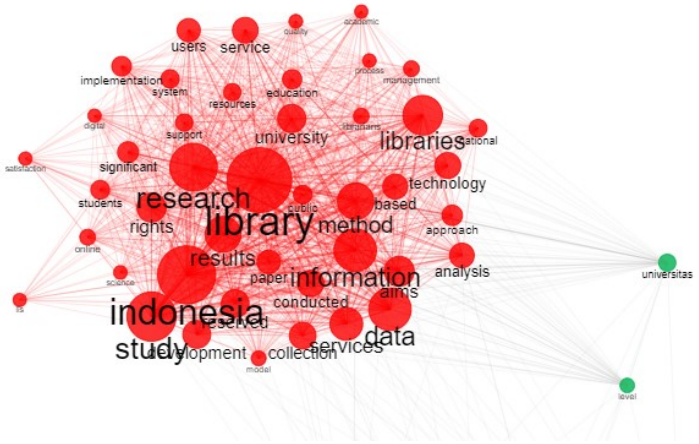

Figure 4. Keyword co-occurrence network
Source: data processed at Bibliometrix

Table 5. The most influential keywords

Keywords	Year	Strength	Begin	End	2013 - 2022
public library	2013	2.17	2020	2022	
information system	2013	1.23	2016	2018	
library information system	2013	1.12	2016	2018	
information management	2013	1.12	2016	2018	
information service	2013	1.06	2016	2017	
government institution	2013	1.06	2016	2017	

Source: data processed at CiteSpace

5. Identify Knowledge Clusters

Figure 5 illustrates the nine large clusters of knowledge generated by CiteSpace. The largest cluster (#0) has 28 members and a silhouette value of 0.687 and was labeled as a *public library* by LLR (Log-Likehood Ratio). While the latest cluster, namely cluster # 3, was labeled as digital health care (electronic medical record) by LLR in 2021. These results indicated that the *public library* was

the main knowledge domain in the LIS study, including the *smart public library, smart library,* and *smart environment* in cluster members.

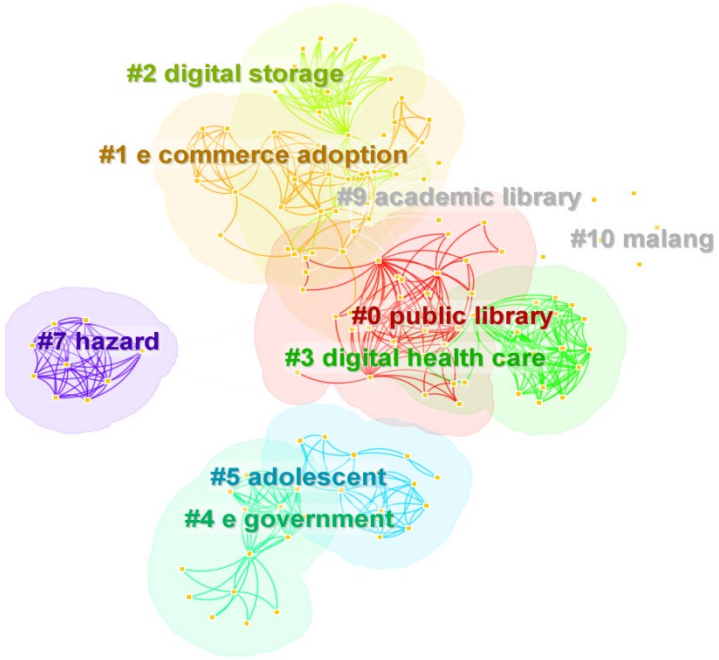

Figure 5. LIS and library technology knowledge domain clusters
Source: data processed at CiteSpace

6. Discussion

A bibliometrics analysis of LIS and library technology in Indonesia can provide valuable insights into the state of LIS and library technology research in the country, including the most active researchers and institutions, the most common research topics, and the level of international collaboration.

One of the key findings from these findings is that the number of LIS studies collaborative in Indonesia is relatively high. The author from Indonesia collaborated with writers from Malaysia, the USA, Australia, and Thailand for the subject of the LIS study in Indonesia. Although the number of Indonesian publications compared to other countries in the ASEAN region is still relatively medium. According to Patra and Chand (2009) LIS publication in ASEAN countries, Singapore leads with 750 records, Malaysia has 566, Thailand has 248, Philippines has 248, Indonesia has 227, Vietnam has 163, Myanmar has 41, Cambodia has 39, Laos has 25, and Brunei has 11 records .

Another finding may be that many LIS and library technology publications in Indonesia focus on specific topics such as public library, information system, library information system,

automation, and big data. This suggests that there is a need for more research on other aspects of LIS and library technology, such as user behavior, knowledge organization, or digital libraries.

Another key finding may be that a small number of institutions and researchers are responsible for most LIS and library technology publications in Indonesia. This indicates that the field is not very diverse regarding authorship and institutions. However, it could also be the result of a lack of funding and resources for LIS and library technology research in Indonesia or a lack of awareness of the importance of LIS among policymakers.

F. CONCLUSION

This study carried out scientific measurements in the field of LIS and its technology in Indonesia. The study results showed that the annual study growth of LIS and library technology in Indonesia was still relatively low at 3.41%. The highest average citation occurred in 2013, with 5.67 points. The University of Indonesia is in the first position as the institution with the most LIS and library technology publications in Indonesia, with 30 global publications. Followed by Airlangga University, Bandung Institute of Technology, Syarif Hidayatullah State Islamic University, and Bina Nusantara. Oetari and Samsuridzal from the University of Indonesia is the first and second most productive authors in this subject field, and Anna from NAS Institute of Physics Ukraine is the third and the most productive foreign author.

The author's collaborative network in studying this subject is spread both locally in Indonesia and with foreign institutions. Authors Indonesia is the country with the most frequency of cooperation, namely 21 collaborations with the US, Thailand, Malaysia, and Australia. Meanwhile, the country with the least collaboration on this study subject is South Africa.

The most relevant sources were dominated by proceedings, indicating that the LIS and library technology in Indonesia study was still in its early stages of scientific research. Journal articles dominate the ten documents with the highest impact, displaying the most cited journal articles in references.

Library keywords were the most commonly used 349 times, while technical terms used were *information systems* (5%), *search engines* (2%), *automation, and big data* (1%). The resulting knowledge clusters were 9 clusters, where cluster # 0 *public library* was the largest, with 28 members. This cluster includes the topics of the *smart public library*, *smart libraries, and smart environments* within its cluster members.

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