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Supply Chain in Library: A Bibliometric Analysis

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ABSTRACT

The research objective of this paper is to identify and map supply chain research in a library. This study conducted a bibliometric analysis using the Scopus electronic database. The article search is done by filtering search results in the system and manual exploration to get relevant articles. The collected articles are processed with the VOSviewer application to obtain research mapping results. A total of 81 articles were obtained from 1999 to 2021, with an increasing trend in the number of articles each year. The United States and China are the most productive countries in this field. Three cluster topics were obtained: supply chain integration in digital libraries, the benefits of open source applications in libraries, and digital data issues in libraries. The results of this study provide an additional overview of supply chain mapping in libraries.

Keywords: supply chain, library, bibliometric analysis, Scopus, VOSviewer.

INTRODUCTION

Today's environment is rapidly changing, starting with technological developments, global influence, social and economic stability. Organizations must improve their external and internal performance to remain sustainable as similar organizations internationally and domestically increase. Organizations realize that increasing efficiency is not enough. Organizations need supply chain management to make the organization more efficient and competitive. Supply chains are essential for organizations trying to survive in a dynamic environment. (Childhouse & Towill, 2003).

Libraries are in an environment with limited budgets for operations, less expensive and faster technology developments, and many users who demand a broader reach. This condition makes most library administrators struggle to provide products, services, and numerous information systems that often change over time.

Today's library users learn to get much information with less effort. As a result, libraries are considering new ways to manage library activities. Limited resources and many cases in the

library require a quick solution, including both vertical and conventional organizational restructuring. The success and survival of a library depend on the ability of management to coordinate a network of relationships with the library's internal and external supply chain processes to arrange the services users want (Kress & Wisner, 2012). Libraries that produce sustainable effectiveness deliver high-quality service and information products that satisfy users (Christopher, 1999).

Stakeholders need to understand what library users need and the process of turning information content into valuable information resources and related services. One strategy to improve library quality is supply chain management practices. According to Kress & Wisner (2012), over the past few decades, research and practice in supply chain management have yielded a valuable set of tools for organizations looking to save costs while enhancing quality and customer service.

Cornish (1996) suggested that the supply chain had been applied to the library to refer to the information needs of the library, and the selection of intellectual property can improve the flow of information to meet user needs. According to Ball (2004), the information supply chain describes the library supply chain process as creation, article aggregation, access, and use. Libraries are identified as intermediaries, supporting aggregation, access, and use functions.

The importance of supply chain management in today's libraries makes researchers map themes related to supply chain and library. This study will analyze the literature on supply chain and library from previous studies. This study uses the Scopus database to use biometric analysis with VOSviewer and spreadsheet applications.

LITERATURE REVIEW

Supply chain in library

Deriving from knowledge management theory, Katsirikou (2003) proposes a library supply chain model consisting of four integrated parts: the first part is knowledge sources such as publishers, database providers, digital media, and research providers; the second part is the content and knowledge system of the library; The third part is then the organization acts as a service and distributor; The fourth part is library users. Pathak & Pathak (2010) apply Porter's value chain model to higher education as a service institution. They explain that changes in higher education require effective cost control to maximize customer interests. They identified some of the impetus for higher education management as a business. One driving force, technology, has dramatically changed the way users navigate the provision of information resources.

Cho (2010) recommends performance measurement in the supply chain as a rating system for sharing library resources. He pointed out that resource sharing and traditional supply chains are similar in terms of using information technology, standardization, and integration of all users. The library can optimize performance by emphasizing the importance of improving user satisfaction everywhere in the organization's supply chain.

Scopus

Scopus's electronic database is an international scientific article with a high reputation, such as Thomson Reuters. Scopus is a comprehensive database of research papers in science, technology, health, social sciences, arts, and humanities (Thaha et al., 2021). The Scopus database includes journals, conference proceedings, reviews, and book chapters. Scopus can visualize, analyze, and track research results to search for information sought. Scopus can also help map research results found in the field of study, author, publisher, location, and keywords.

Bibliometric analysis

Bibliometric analysis from literature can provide objective knowledge and information about the quantity and quality of scientific work (Narin, 1994). Bibliometric studies in information science can reveal patterns of documents, literature development, or sources of information within a field of study. Bibliometrics includes two types of studies: descriptive studies and evaluative studies. Descriptive studies analyze the productivity of articles, books, and other formats by looking at authorship patterns such as the gender of the author, the type of author's work, the level of collaboration, the productivity of the author, the affiliation of the author, and the subject of the article.

VOSviewer

VOSviewer is an application for processing and viewing bibliometric mappings. VOSviewer has a text mining function to build and visualize relationships from various articles. Processing results can be displayed in more detail in multiple forms such as mapping, calculations, and relationships. VOSviewer can present and represent specific information about certain topics bibliometrically. Vosviewr facilitates bibliometric data processing to gain insight (Van Eck & Waltman, 2010).

METHOD

The analysis used in this research is bibliometric. This research expects to overview patterns and mapping related to the latest supply chain and library themes. Bibliometric analysis methods are usually used to study productivity and evaluate previous studies quantitatively. Figure 1 summarizes the procedure from collecting data in the Scopus database, filtering, to

analyzing the results. The procedure used uses bibliometric analysis research in similar studies (Thaha et al., 2021). The Scopus database was used in this study by searching for articles related to supply chain and library themes. The Scopus database was taken from the beginning of the research until 2021. The primary searches in this research are supply chains and libraries for further development of searches in the Scopus database into:

<div align="center">"Supply Chain" AND ("Library" OR "Libraries")</div>

Search strings are performed on titles, abstracts, and keywords in the Scopus database to avoid inappropriate results. The search results found 394 articles in journals, conferences, and editorials between 1998 and 2020. The articles then filtered the search results by doing an English filter, then manually reviewed through titles, abstracts, and keywords to get relevant articles. The filtered articles resulted in 81 relevant articles between 1999 and 2021 for further processing using a spreadsheet application and VOSviewer.
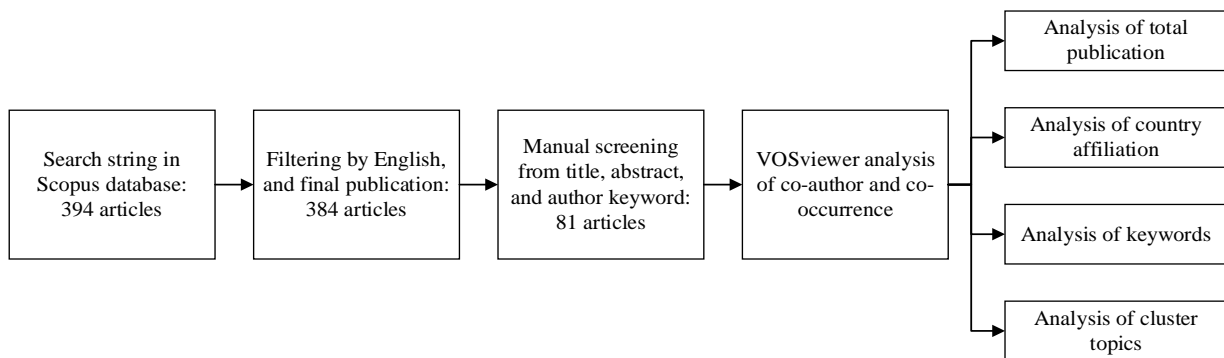

Figure 1. The procedure of data collection and bibliometric analysis

RESULT AND DISCUSSION

Analysis of total publications

Based on the Scopus database taken, the number of articles related to supply chain and library themes has continued to increase since the beginning of its appearance, as shown in Figure 2. From 2018 to 2021, the total number of articles increases with the most articles in 2021 as many as 10. The results of previous explorations showed that the growth in the number of articles was due to the large number of research related to supply chains in digital libraries in line with the development of information and communication technology during the COVID-19 pandemic. The number of articles influence by software use that connects various activities and jobs in the library.
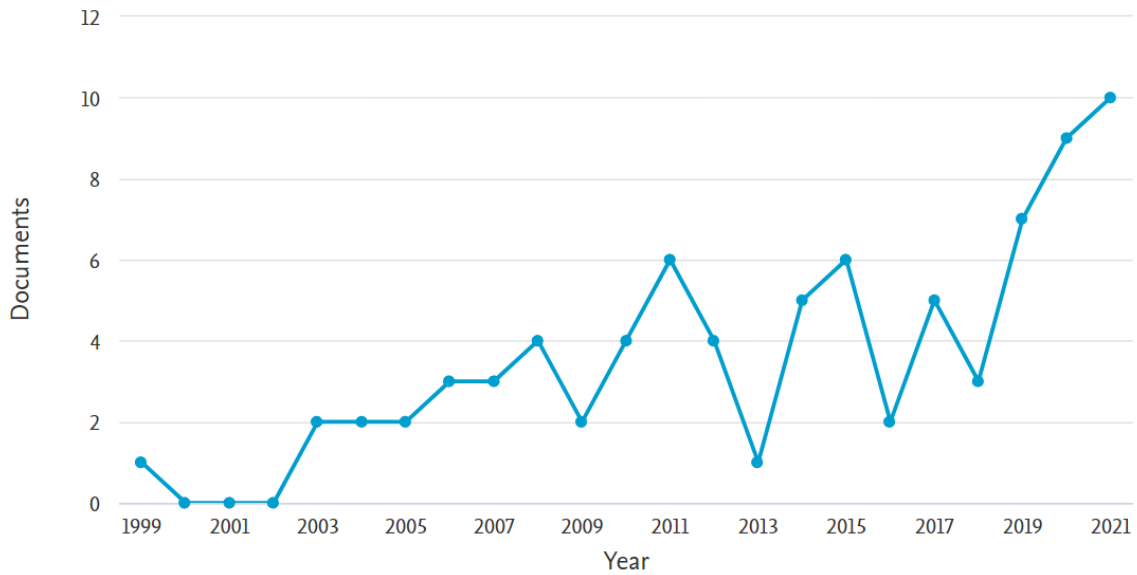
Figure 2. Documents by year in supply chain and library from 1999 to 2021 in the Scopus database

Analysis of country affiliation

There are 30 author countries in the search results in the Scopus database. Figure 3 shows the 15 countries with the highest number of article author affiliates. The most significant contribution to research on supply chain and library themes was the United States, followed by China. Furthermore, research in this field was mainly made by European countries, followed by Asian countries such as India and Indonesia as many as two articles.
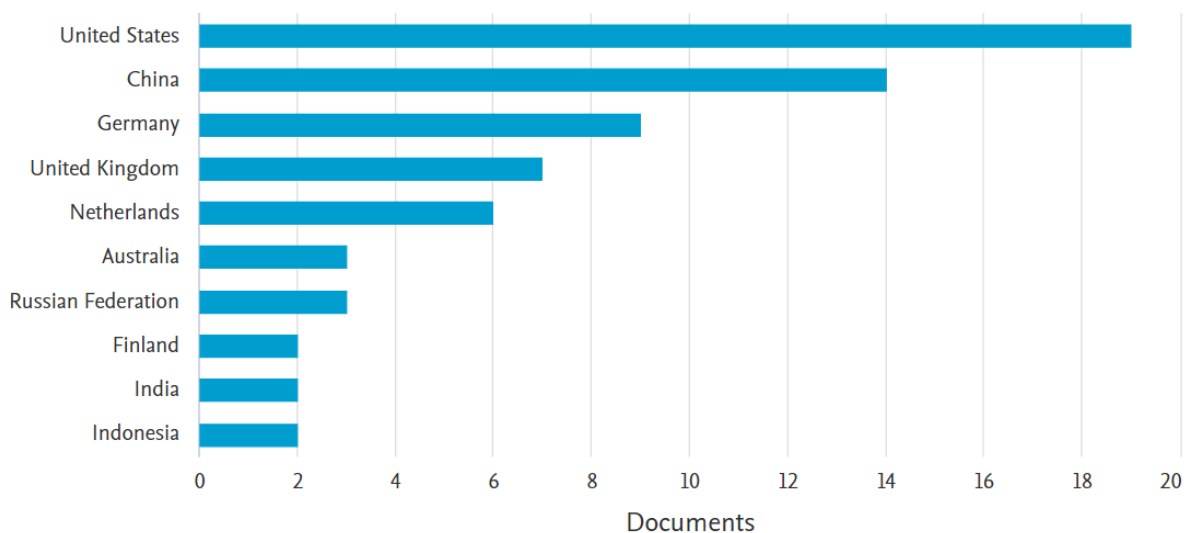

Figure 3. Documents by country in supply chain and library in the Scopus database

From these data, it can be said that the United States and China greatly influence research in the supply chain and library fields. This statement is supported by additional data in the number of citations. The two countries have the most significant number of citations compared to other countries.

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Analysis of keywords

Keyword processing of articles with VOSviewer initially generates 1094 keywords. Keyword filtering was carried out with a minimum of five occurrences in the filtered article database. The result showed 14 relevant keywords for further clustering of the results of VOSviewer processing. Popular keywords that appear the most are supply chains, supply chain management, digital libraries, life cycle, supply chain, and application programs. Table 1, in addition to describing the number of occurrences of keywords, also analyzes the total link strength that appears and the clusters of keywords.

Table 1. Keyword cluster with the occurrence dan link strength

Cluster	Keyword	Occurrences	Total Link Strength
1	Supply Chains	54	80
	Libraries	24	38
	Digital Libraries	21	37
	Life Cycle	7	19
	Supply Chain	7	6
	Systematic Literature Review	5	13
2	Application Programs	6	14
	Computer Software	5	13
	Manufacture	5	12
	Open Source Software	5	18
	Open Systems	5	18
3	Supply Chain Management	22	21
	Digital Storage	5	12
	Information Systems	5	7

Analysis of cluster topics

The previously appeared keywords were clustered based on the relationship and occurrence approach to creating a network visualization. In figure 3, keyword relationships are depicted with nodes, lines, and similar colors for the relationships between keywords. The clustering results by VOSviewer obtained three clusters with red, green, and blue colors. The first cluster contains six keywords: supply chains, libraries, digital libraries, life cycle, supply chain, and systematic literature review. The second cluster contains five keywords: application programs, computer software, manufacture, open-source software, and open systems. The third cluster contains three keywords: supply chain management, digital storage, and information systems.
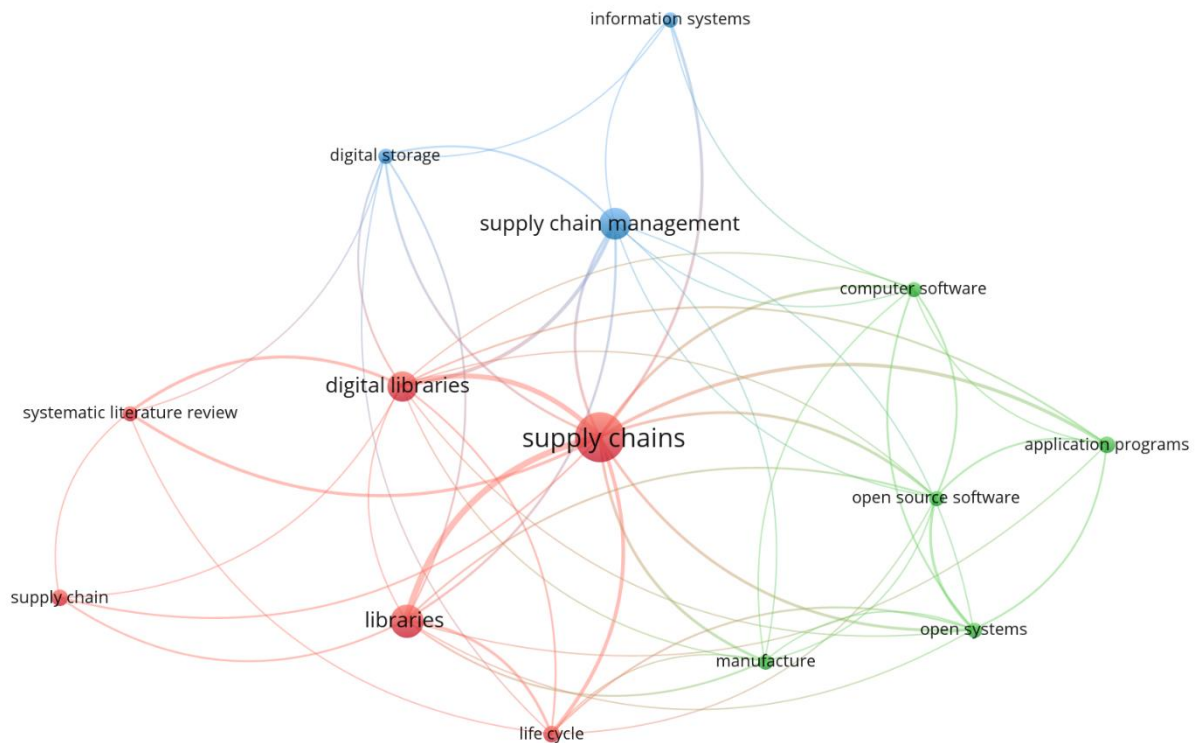
Figure 4. Network visualization of keyword articles related to supply chain and library

The first cluster describes the supply chain of digital libraries integrating digital libraries, content providers, content sources, institutions, and third parties through service integration on a uniform information service system. Integrating these services is expected to perform a similar work life cycle and automatically (Meng-xing et al., 2010).

The second cluster initially explained a lot about open source libraries for simulation and programming needs. Upon further exploration, several studies outline the benefits of open access, open-source, and the use of open-source software in the increasing library and information community. Digital libraries, open access, and open-source software are natural outcomes of available knowledge exchange communities that help communities grow and thrive. Digital libraries use open source applications to capture, catalog, store, search, protect, and retrieve information to facilitate access to large amounts of digital information (Krishnamurthy, 2008).

The third cluster describes issues related to digital data storage in libraries and how information systems play an essential role in these issues. Digital data storage requires excellent durability and scalability. Component failure, obsolescence, human operation errors, natural disasters, attacks, or management errors are common difficulties that must be learned so that the implementation of digital storage in libraries runs well. This threat can be minimized by using a distributed data storage approach (Jing, 2016; Sosa-Sosa & Hernandez-Ramirez, 2012).
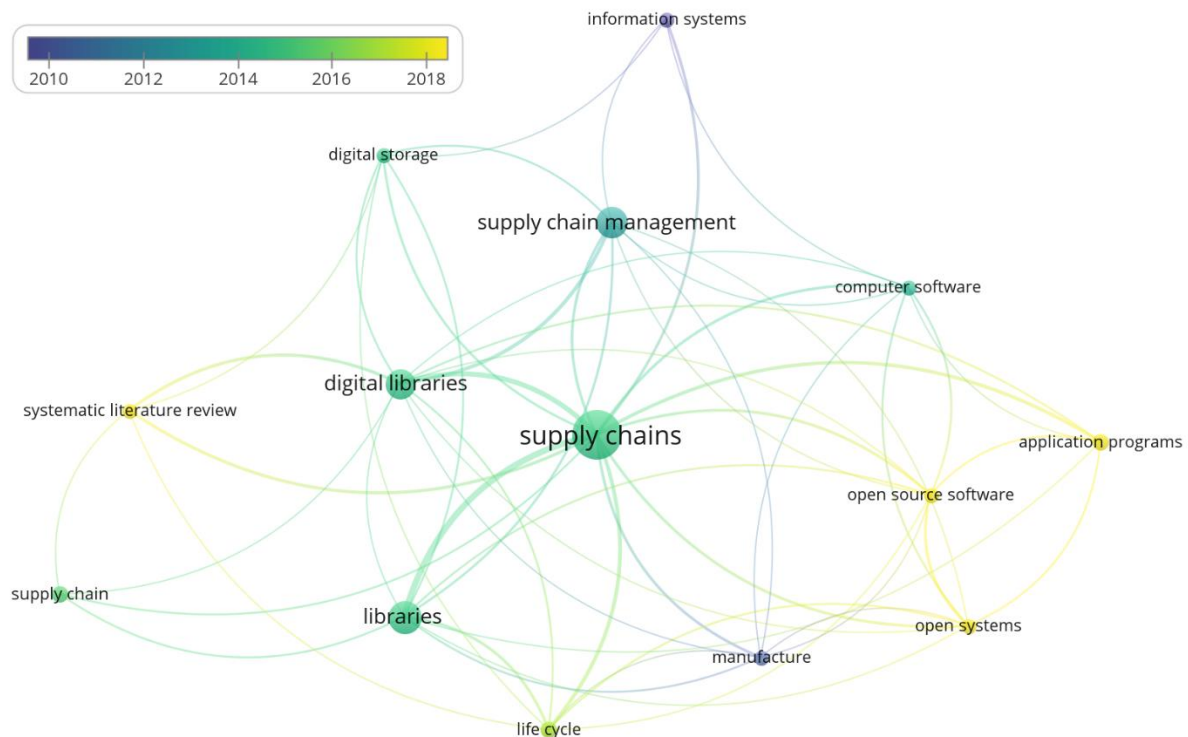
Figure 5. Network overlay of keyword articles related to supply chain and library

Figure 5 visualizes the topic from the beginning of the research to the current topic. The color of the keyword nodes in the image indicates the research period on that keyword or topic. Judging from the figure, five keywords such as lifecycle, open system, open-source software, and application programs are currently developing research topics. This figure shows that the supply chain and library topic has evolved from manufacturing and information systems to open source systems and library life cycles.

CONCLUSION

This biometric analysis provides an overview of articles on Scopus on topics and libraries. The review results show that research trends and patterns in the Scopus database from 1999-2021 tend to increase. The United States and China are the most productive countries, followed by a very high citation.

The results of the mapping resulted in three clusters using VOSviewer. The first cluster is related to supply chain integration and digital libraries. The second cluster is related to the benefits of open source applications in libraries. The third cluster is related to digital data and information systems issues in libraries. Topics such as lifecycle, open systems, open-source software, and application programs are current topics in the supply chain and library fields.

Limitations of this study In the use of one database and one application in conducting a review, namely the Scopus database and the VOSviewer application, in the future, it is expected to

compare research data more broadly outside of the Scopus database and different bibliometric analysis applications.

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