

Research Hot Spots and Their Development Trends of Supply Chain Technology Innovation

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Abstract: The rapid development of supply chain technology has become a major help to the current economic development. using CiteSpace software to draw the knowledge map of authors, institutions, keywords and so on, this paper analyzes and comments on the supply chain technology research literature published in the Chinese academic network publishing library (CNKI) in China. research findings: single combat between various research institutions and scholars, lack of communication and cooperation; research hot topics are supply chain management, technological innovation, information technology, supply chain finance, internet of things, rfid technology, electronic data exchange; supply chain finance, blockchain technology, blockchain technology and big data are the main research trends of supply chain technology research.

Keywords: Supply chain technology, Visual analysis, Hot topics, Trends.

1. Introduction

With the development of the times. The country issued a call to vigorously develop the supply chain. With the development of all aspects of technology, more and more enterprises have made remarkable achievements and gained strong competitiveness in the process of supply chain technology development. With the higher demand for private customized products and instantaneous services, supply chain management becomes more complex and poses a higher challenge to supply chain technology. Enterprises in the global expansion of business, the process will be more cumbersome. Therefore, supply chain technology plays an irreplaceable.

2. Research Tools and Data Sources

2.1. Research Tools

This study uses the visual analysis software developed by Dr. Chen Chaomei of Drexel University CiteSpace as a research tool. The software is based on JAVA programming language and is widely used to analyze the research hotspots and trends in a certain research field. CiteSpace is to use the basic principle of information visualization method, bibliometrics method and data mining algorithm integration, draw visual map, establish the association between nodes to analyze the co-occurrence relationship and co-citation relationship between the research objects, and so on.

CiteSpace is a visual software based on java programming language developed by Dr. Chen Chaomei of Drexel University in the United States. The software mainly uses the basic principles of information visualization, metrology, data mining algorithm and so on to draw visual map, get nodes,

density and connection to analyze the co-occurrence relationship and co-citation relationship of the research object. [1] this paper mainly uses the software as a tool to analyze the hot spots and trends of supply chain technology application.

2.2. Data Sources

Click Advanced Search, Search conditions are "supply chain technology" and "enterprise ", That is, the application of retrieval supply chain technology in enterprises, The search date is as of December 17,2020, A total of 2997 articles were obtained. To eliminate foreign literature, domestic conferences, newspapers and other documents which do not conform to the theme of the paper, Received 915 journals ,468 master thesis ,48 doctoral thesis, A total of 1431 articles were analyzed. Each of the four downloaded files is named download_xx", And put it in the input folder built in advance.

The CiteSpace software is run to convert the target literature in the input folder to meet the requirements of the CiteSpace document format, and the sample data inventory is placed in the folder output.

3. Data Results Analysis

3.1. Basic Statistics of Communications

Figure 1 reflects the changes in the number of CNKI published in the literature on the application of supply chain technology in enterprises. From the diagram, The first one appeared in 1998, Less research literature on supply chain technology by 2014, Under 100, It peaked at 104 in 2014, Then there was a small decline, Starting to rise steadily by 2016, In 2020,140 articles are projected. So, you know, The application of supply chain technology in enterprises and the future development trend have attracted wide attention of scholars.

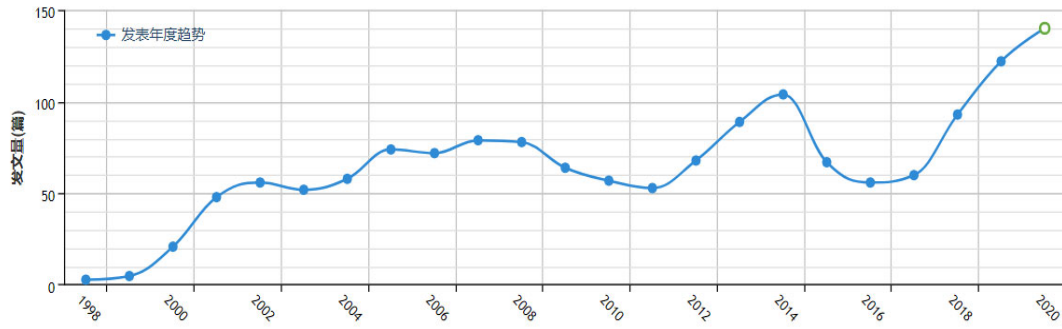


Figure 1. Trends in communications

3.1.1. High-yield Institutions

CiteSpace, of operation Set from 2000 to 2020, A time slice

year,1 Institution, node type TopN=50, Pruning check Pruning sliced networks, Other default settings, The specific settings are shown in figure 2.

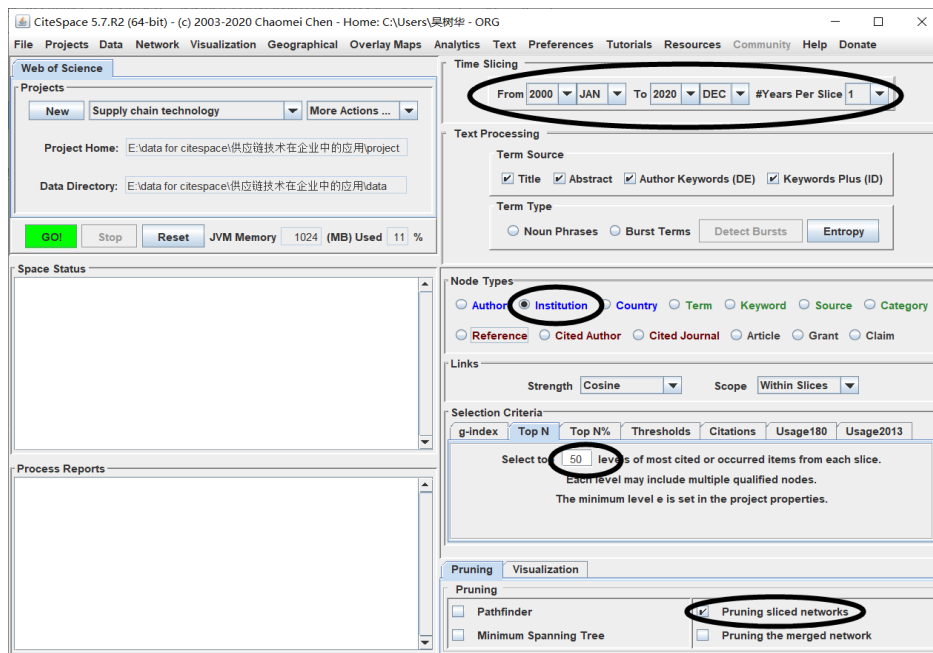


Figure 2. Parameter Setting of Institutional Node

The knowledge map of the mechanism with node number 838, connection number 188 and density 0.0005 is obtained. It can be seen from the figure that the large number of nodes such as the School of Management of Shanghai University of Technology, the School of Economics of Ocean University of China, the School of Economics and Management of Shandong University of Science and Technology, Qingdao Agricultural University, etc. However, although the number of nodes is many, the number and density of connections are very low, indicating that there is less cooperation between institutions and lack of cooperation consciousness. [2]

3.1.2. Core Author Group

Continue CiteSpace, operation Author, the node type Other parameter settings and mechanism parameter settings are consistent, Get the number of nodes 1942, Line 1095, The co-occurrence knowledge network map of the authors with a density of 0.0006. The biggest scholar is Ye Chunming, Zhong Cuiping, Liu Xinmin, Liu Qinmin, Chen Xiang, Zhang Dongliang, Wang Lei, Zhang Zhi, Huang Haitao, Li Junxiang, And these authors studied supply chain technology earlier, Both began in 2000. The picture shows that Ye Chunming and

Huang Haitao are closely related to other authors, while other authors communicate less. [3]

3.2. Research Hotspots

The research focus reflects the research focus and direction of a certain research field, which is of great significance for understanding and analyzing the research content in this field. As the core of the content of a literature, the research focus of a certain field is mainly reflected by the frequency of keyword emergence in this field. [4] keyword clustering analysis is based on keyword co-occurrence analysis, the keyword co-occurrence network relationship is simplified into a relatively small number of clustering processes by clustering statistics. [5] this paper analyzes the research situation of supply chain technology in enterprises by keyword clustering analysis, in order to explore the hot topic of supply chain technology in China.

3.2.1. Keywords

CiteSpace, again Keyword, set node type 3 sets of c, cc, ccv 1, 1,20; 1,1, 20; 3,3, 20, Other settings are as above. After generating the keyword knowledge network map, Choose LSI

algorithm, Get the keyword clustering network map. As shown, The diagram shows "supply chain management ", "Technological innovation ", "Information technology ", "Supply Chain Finance ", "Internet of things ", "rfid technology ", Seven clusters of EDI, It reflects the hot spot of supply chain technology application in enterprises.

Based on the knowledge map of keyword clustering, the logarithmic likelihood rate is obtained in "ClusterExplorer", and the keyword co-occurrence network clustering table is obtained.

3.2.2. Thematic Areas

By analyzing the key words in each cluster, it is found that the research contents of each cluster are intersected, so the research of supply chain technology can be summarized as "supply chain management ", "technological innovation ", "Internet of things ", "RFID technology" four thematic areas, detailed as follows:

(1) Research topic of Supply Chain Management. Key words such as business process, manufacturing resource planning, business process, mainstream technology, etc. [6] supply chain management is mainly based on customer demand, with the goal of improving quality and efficiency, with the integration of resources as a means to achieve product design, procurement, production, sales, service and other processes of efficient and collaborative organizational form. So the company in addition to procurement, production, logistics and other departments, but also need to plan departments overall consideration. Therefore, who should undertake the function of overall planning and integrate resources is the key topic of scholars' concern. Huang Gang and others argue that in the environment of market opening, with the transformation of "Internet" information technology, the competition between companies is not only reflected in the advantages of products and services. And deeper and more important in the supply chain management competition. [7]

(2) Research topic on technological innovation. Key words such as supplier participation, resource dependence, vertical technology alliance, vertical marketing alliance, etc. [8] looking at the development course of supply chain, it always revolves around the process of innovation, standard, cooperation, replication, re-innovation and spiral rise. [9] due to different regions and industries pay different attention to supply chain technology, the development of supply chain in various places shows serious imbalance. According to the development level of supply chain, supply chain can be divided into original supply chain, primary supply chain, integrated supply chain, cooperative supply chain and intelligent supply chain. [10] Chen Junying and others studied the relationship between the rapid development of supply chain technology and the formation of a new situation of open innovation under the situation of implementing innovation-driven development strategy in China. For the innovation and development of high-tech enterprises to provide practical solutions. [11]

(3) Research topic of the Internet of Things. Mainly includes supply chain finance, Internet of things finance, movable property financing, Internet of things technology and other keywords. [12], there is a contradiction between the optimal solution of the whole supply chain and the maximization of the interests of a single enterprise. It is mainly because of the lack of information exchange and communication between upstream and downstream enterprises, which leads to the conflict of configuration between related businesses, and to a certain extent, the

division of supply chain between enterprises. It leads to the loss of the effectiveness of the overall competitive relationship. [13], the application of Internet of things can make enterprises establish dynamic alliance mode, establish unified and stable performance standard, and achieve the monitoring of the whole supply chain system. Wu Jun and others analyzed the risk sources and influencing factors of supply chain finance, combined with the unique function of Internet of things technology and the business process of inventory pledge financing and the business process of inventory pledge financing model. [14]

(4) Research topic of RFID Technology. Mainly includes label cost, revenue coordination, automobile supply chain, information traceability and other keywords. [15] RFID is a non-contact automatic identification technology, which can automatically identify target objects and obtain relevant information through radio frequency signals, without manual intervention and can accurately identify moving objects in various states. RFID tags are far more powerful than bar codes, such as faster reading speed and more accurate reading quality, and are widely used in manufacturing management. [16] High accuracy and efficiency of is the key to improve inventory management ability and enterprise decision-making. Continuous successful cases show that the accuracy of RFID inventory management continues to improve, but also improve the timeliness, efficiency and accuracy of customer service. Chen Shuang et al. are committed to solving the problem of inaccurate information in inventory management. Because of the preference of the application of RFID technology, the application of RFID technology in supply chain must be analyzed to fully understand the impact of the application of new technology on supply chain coordination. [17]

3.3. Trends in Research

The emergent word is the key word with the sudden increase of citation frequency in a certain time period, which can be used to reflect the research trend in a certain time period. [18] in view of this, in order to further study the development trend of supply chain technology, the key word outburst diagram is obtained by setting the operation CiteSpace, parameters "Burstterms".

As can be seen from the diagram, From 2001 to 2007, the words "E-commerce" and "Enterprise Resource Plan "; From 2002 to 2003, the emergent words are "information technology" and "supply chain management "; Highlighted in 2013-2016 as "Internet of things" and "RFID technology "; The emerging words from 2018 to 2020 are "supply chain finance ", " blockchain technology ", " blockchain" and "big data ", The flash - forward rate continues to this day, It shows that these technologies are the main development trend of current research.

In addition, the keyword sequence diagram can be used to reflect the main research contents of a certain research topic with time, and to a certain extent, it can also reflect the research trend in a certain period of time. Running CiteSpace, on the basis of keyword co-occurrence analysis, according to the time segment to generate keyword timing map.

(1) It can be seen from the diagram that the research concerns are different in different periods, so the development of supply chain technology in China can be divided into three stages: basic development period, prosperity period and new period, in order to better study the development and evolution of supply chain technology.

In the period of basic development (late 1990s-2007), supply chain technology in China is in a period of progressive development. Due to the problems of insufficient R & D capability, backward enterprise concept and insufficient training conditions, the attention paid to supply chain technology is low, the development of related technology is slow, and the influence on enterprises is not deep. [19] therefore, the research on supply chain technology has not been paid more attention to, and the research is not systematic.

(2) The boom period (2007-2016). In this period, the number of enterprises using supply chain technology in China is increasing, and the existing problems are becoming increasingly prominent. Therefore, the research on supply chain technology is increasing gradually, and the research direction is diversified. The research is carried out from the

aspects of "supply chain management" and "technological innovation", focusing on the whole process of enterprise R & D, procurement, production, sales and logistics. At the same time, many supply chain technologies can not meet the rapid development needs of enterprises because of lack of R & D capacity and limited funds.

(3) New era (2016-present). In this period, with the successful application of supply chain technology in many enterprises and the development of Internet technology, many scholars have increasingly systematic and comprehensive research on supply chain technology. [20] in this period, due to the rapid development of Internet technology, supply chain technology is more widely used and R & D costs are lower. Many enterprises use supply chain technology to build new market competitive advantage.

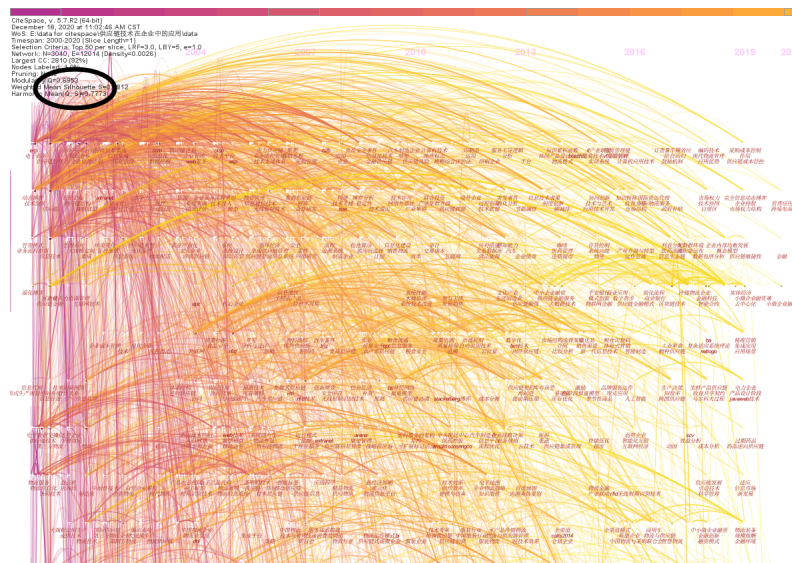


Figure 3. Keyword Sequence Density Analysis

Conclusions and outlook

On the application of supply chain technology in enterprises:

(1) From the current volume of communications on supply chain technology, the overall volume of communications on supply chain technology has shown a slow upward trend, and the volume of communications has increased rapidly since 2016, indicating that the research on supply chain technology has gradually attracted attention.

(2) The data on the volume of institutional communications show that there is a large difference in the volume of communications between different agencies and a small number of links between agencies, indicating that most of the agencies are single research and lack of awareness of cooperation with other agencies. In the future, we should strengthen the cooperation consciousness and communication spirit among the various institutions in order to speed up the research progress of supply chain technology and improve the research efficiency.

(3) From the research hot spots and trends, China's supply chain technology research is mainly around the supply chain management, technological innovation, Internet of things, RFID technology topics, and supply chain finance, blockchain technology, big data from the emergence of the topic is still a major concern, which shows that these aspects are the supply chain technology field and need to be solved. Therefore, in the future, we should pay attention to system

optimization and the performance of the whole supply chain, pay more attention to coordination; pay more attention to the precision, effectiveness and value-added requirements of the supply chain process compared with customer service satisfaction; pay more attention to lean manufacturing based on full value chain; pay more attention to the three-dimensional platform function with manufacturing enterprise as the breakthrough point; pay more attention to user experience and think about what kind of service customers need on the client side.

In a word, the development of Internet technology has injected new vitality into the innovation of supply chain technology. In the process of supply chain management, we should not only have the overall management thought, but also build a digital cooperative platform of production and marketing strategy with the help of supply chain technology.

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