Visualized Analysis of Researches on Logistics in China

Dandan Che

Yuncheng Polytechnic College, Xueyuan North Road, Yuncheng, China

Keywords: Logistics; Co-word analysis; Social network atlas; Visualization analysis

Abstract: In order to understand the current situation,research hotspots and trends of logistics research in China, this paper takes 3641 articles about logistics in CNKI as research object, and makes bibliometric and visual analysis from five aspects: annual volume, core authors, publishing institutions, source journals and high frequency keywords, using Bicomb2.0, Ucinet, SPSS and Excel software. Research shows that :the research on logistics has entered a "prosperous period" in China, with more papers published annually; Ju Songdong, Wang Yong and Li Songqing are prolific authors; Southwest Jiaotong University, Beijing Wuzi University, Beijing Jiaotong University are the main units of logistics research. At present, supply chain, e-commerce and third party logistics are the hotspots of logistics research. And the Belt and Road Initiatives, cold chain logistics, green logistics and big data are the key points and directions of future logistics research.

1. Introduction

With the development of computer technology, scholars' research on logistics has gone from basic theory to subject system and research hotspots. Yin Hui and Chen Jin made a visual analysis on the research hotspots of logistics discipline in China with keywords as object [1]. Liu Jia and Li Yaman have studied the research hotspots and trends of emergency logistics [2]. Wang Chuanlei and Wang Jingjuan, taking the text of government network as the research object, visualized the hotspots and development frontiers of logistics industry [3]. The above scholars have carried out visual analysis on a certain field or a aspect of logistics, but the research is not comprehensive. Based on the periodical literature in CNKI, this paper will make a comprehensive analysis on the research of logistics discipline in China from the quantity of articles, authors, institutions and keywords.

2. Data sources and research methods

Firstly, this paper chooses the core journals, EI journals, SCI journals, CSSCI and CSCD of CNKI as data sources; the search topics and keywords are logistics; search deadline is 31 December 2018. After these operations, 4858 papers were obtained. Secondly, the repetitive and non-conforming documents such as logistics news, interview records, survey reports, lectures, conference information and paper solicitation were removed. Finally, 3641 journal documents were obtained, of which 2065 were published in the last ten years (2008-2018).

Based on these 3641 documents, this paper uses Co-word analysis and social network analysis methods, uses Bicomb software to process and statistics the literature information, and uses Ucinet software to draw visual atlas, so as to visualize and analyze the research hotspots and trends of logistics discipline in China.

3. Analysis of the overall situation of documents
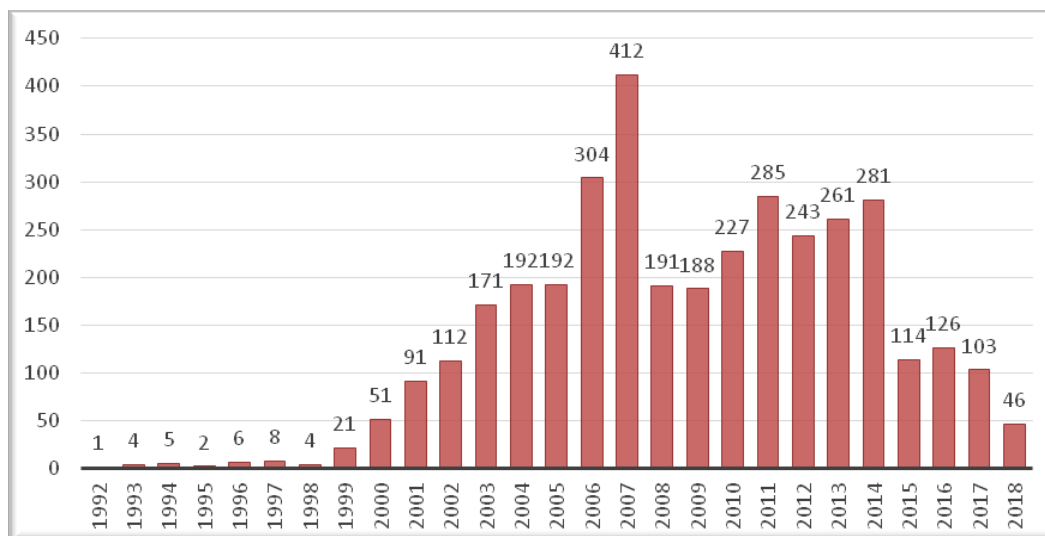
3.1 Quantity of publications

Figure 1 Annual distribution of documents in logistics.

Figure 1 shows the annual volume of papers. From the figure, we can see that the volume of papers in logistics discipline in China is on the rise as a whole. The total number of papers is 3641, with an average annual volume of 135. The research on Logistics in China started in 1992, and in the next six years (1992-1998), there were few papers published. Until 1999, the number of articles published exceeded 10, and 21 articles were published. From 2000 to 2007, the number of publications rose sharply, reaching 412 in 2007, which is the highest level at present. Since 2007, Chinese scholars' research on logistics has been relatively stable, and the annual number of papers has remained at about 200.

3.2 Core Author

The core author is the author with great academic influence in a certain field. Core authors can be identified by the amount of papers sent and the frequency of citations of the author's literature. According to the author's statistics of the literature, 4315 authors were obtained, of which 3183 were appeared as the first author. In order to determine the core author, Price law is adopted in this paper. Price law [4] is used to measure the distribution of authors in literature. Through this law, the number of core authors in a field can be determined. Ju Songdong, the author with the largest number of articles on logistics, has published 11 articles. According to Price law, the number of core authors is 3, and there are 82 core authors (Table 1).

Table 1 Authors and publications of logistics in China (Top 15).

Order	Author	Number	Order	Author	Number	Order	Author	Number
1	Ju Songdong	11	6	Yang Fan	6	11	Li Min	6
2	Wang Yong	8	7	Ma Jun	6	12	Wang Zhitai	6
3	Li Songqing	8	8	Hu Dawei	6	13	Luo Wenping	5
4	Peng Qiyuan	7	9	Tang Yinying	6	14 Zhang Xiaheng	5	
5	Dong Qianli	6	10	Zhang Chunxia	6	15	Li Huaizheng	5

Table 1 lists the top 15 authors, and only Ju Songdong has more than 10 articles. Table 2 lists the top 10 authors and cited frequency of a single paper in logistics discipline. The most frequently cited article entitled" Emergency Logistics" [5], which is by Ou Zhongwen, Wang Huiyun and Jiang Dali. The frequency of citation is as high as 463 times. Combining Tables 1 and 2, we can see that there is not much overlap between high-yielding authors and highly cited authors.

Table 2 Top 10 authors cited in a single paper on logistics in China.

Order	Article	Author	Frequency
1	Emergency Logistics	Ou Zhongwen, Wang Huiyun , Jiang Dali	463
2	China's Logistics System for Agricultural Products: Their Development and Institutional Aspects	Huang Zuhui,Liu Dongying	341
3	Logistics Distribution Center Allocation Model	Liu Haiyan, Li Zongping ,Ye Huaizhen	341
4	Analysis of Logistics Financing Business Innovation in China	Feng Gengzhong	279
5	Analysis of Influencing Factors and Cases of Logistics Center Location	Xu Jie, Zheng Kai, Tianyuan	278
6	Current situation and operation mode of China's cross-border e-commerce logistics	Zhang Bin, Liu Xiaojun , Taozhang	276
7	Bi-level programming model and solution algorithm for the location of logistics distribution centers based on the routing problem	Sun Huijun and Gao Ziyou	275
8	An analysis on three modes of international supply chain finance	Xie Shiqing and He Bin	264
9	Planning method of construction scale of logistics park	Li Yumin, Li Xuhong , Mao Navy	233
10	Study on Logistics Park Planning	Wang Zhengquan ,Yang Dongjian	232

3.3 Publishing agencies

By deleting invalid unit information and unifying the same unit name, 1756 unit information were obtained, which statisticed by Bicomb 2.0 software. Table 3 lists the Institutions with more than 20 publications. From Table 3, we can see that the main organization of logistics research in China is universities, among which the School of Economic Management, Business School, Transportation College and Logistics College are the main secondary units. Removing secondary units, only considering primary units, a total of 1424 units were obtained (Table 4). Among them, Southwest Jiaotong University had the largest number of papers, reaching 86. As a non-university unit, the Chinese Academy of Sciences also pays attention to logistics discipline.

Table 3 Statistics of China's logistics subject publishing institutions (Frequency≥20).

Order	institution	frequency
1	Southwest Jiaotong University ,School of Transportation and Logistics	49
2	Beijing Jiaotong University, School of Economics and Management	48
3	Beijing Wuzi University	42
4	Chang'an University, School of Economics and Management,	21
5	Tianjin University, School of Management,	20

Table 4 Statistics of the first-level units of China's logistics publishing institutions (Part).

Order	institution	frequency
1	Southwest Jiaotong University	86
2	Beijing Wuzi University	81
3	Beijing Jiaotong University	72
4	Shanghai Maritime University	47
5	Wuhan University of Technology	45

3.4 Source journals

According to the statistical results of Bicomb software on literature sources, there are 526 journals in total (Table 5). 'Logistics Technology' ranks first, which is the core journal in the field of logistics, and there are many articles related to logistics. In addition, 'China Business and Market'and 'China Logistics & Purchasing'are two journals whose main research object is logistics, and which are sponsored by the master. 'China Logistics & Purchasing' is supervised and

sponsored by China Logistics and Purchasing Federation. 'China Business and Market' is sponsored by Beijing Wuzi University and is the Journal of China Marketing Society.

Table 5 Top 10 journals of logistics in China.

Order	Journals	Number
1	Logistics Technology	390
2	Journal of Commercial Economics	236
3	Market Modernization	192
4	China Journal of Commerce	173
5	China Business and Market	150
6	China Market	134
7	Jiangsu Commercial Forum	118
8	Railway Transport and Economy	111
9	Commercial Research	101
10	China Logistics & Purchasing	75

4. Analysis of research hotspots

4.1 Statistics of high frequency keyword

Keyword is a highly summary of the article, usually including the research topics, research methods and other information of the literature. It is representative to use keywords to analyze hotspots. Before keywords analysis, the high frequency keywords are determined. Firstly, the keywords of 3641 articles were extracted by Bicomb2.0 software, and 5920 keywords were obtained. Secondly, the keywords are processed to remove the meaningless keywords, such as "strategy", "countermeasures", "indicators" and "development", merge synonyms, such as "logistics industry", " Logistics session" are unified into "logistics industry". analytic hierarchy process is replaced by AHP. After a series of processing, 3918 effective keywords were obtained. Finally, high frequency keywords are determined by using the g-index of word frequency [6], and the threshold of high frequency keywords is 47. That is to say, high frequency keywords are the top 47 keywords with frequency greater than 14 (Table 6).

Table 6 High frequency keywords of logistics discipline in China (Part).

Order	Keywords	Frequency	Order	Keywords	Frequency
1	E-commerce	280	11	Informationize	65
2	Logistics Enterprises	276	12	Logistics Management Major	60
3	Supply Chain	236	13	Cost Control	54
4	Logistics Industry	146	14	RFID	53
5	Fresh Agricultural Products	101	15	Capital flow	41
6	Distribution Centre	90	16	Genetic Algorithm	38
7	Third Party Logistics	81	17	Minor Enterprises	36
8	Information Flow	78	18	GIS	35
9	Logistics Distribution	75	19	Logistics Outsourcing	35
10	Logistics Information System	69	20	AHP	33

From Table 6, we can see that there are five keywords with frequency over 100, which are "E-commerce", "Logistics Enterprise", "Supply Chain", "Logistics Industry" and "Fresh Agricultural Products". High frequency keywords cover all aspects of logistics. Supply Chain, Distribution Center, Logistics Outsourcing, Logistics Service, Vehicle Routing Problem and Optimal Routing belong to logistics transportation process. Logistics Information System, GIS and RFID belong to logistics technology. Genetic Algorithm, AHP, Grey Relational Model, DEA and BP Neural Network are the main methods of logistics research. These keywords appeared 2437 times, accounting for 26.06% of the total.

4.2 High frequency keyword analysis

Using Bicomb software, the co-occurrence matrix of 47 *47 is obtained by counting the times of 47 keywords appearing simultaneously in the same document. The Co-word matrix is introduced into Ucinet software to conduct cohesive subgroup analysis, and the cohesive subgroup graph of high frequency keywords is obtained (Figure 2). 47 keywords are clustered into eight subgroups according to their association strength, and each subgroup includes keywords as shown in Table 7.
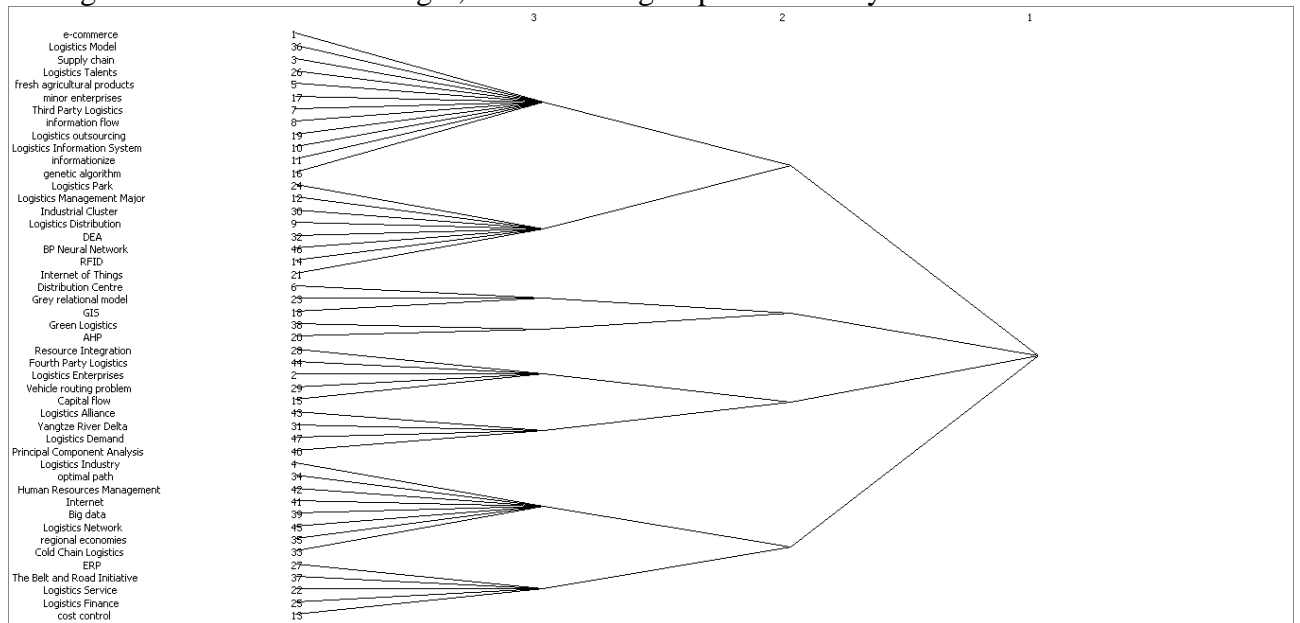

Figure 2 Condensation subgroups graph of high frequency keywords.

Table 7 Subgroups of high frequency keywords.

Subgroup	Keywords	Order
1	E-commerce, Logistics Model, Supply Chain, Logistics Talents, Fresh Agricultural Products, Minor Enterprises, Third Party Logistics, Information Flow, Logistics Outsourcing, Logistics Information System, Informationize, Genetic Algorithm	1, 36, 3, 26, 5, 17 ,7, 8,19, 10, 11, 16
2	Logistics Park, Logistics Management Major, Industrial Cluster, Logistics Distribution, DEA, BP Neural Network, RFID, Internet of Things	24, 12, 30, 9, 32, 46, 14, 21
3	Distribution Centre, Grey Relational Model, GIS	6, 23, 18
4	Green Logistics, AHP	38, 20
5	Resource Integration, Fourth Party Logistics, Logistics Enterprises, Vehicle Routing Problem, Capital flow	28, 44, 2 ,29, 15
6	Logistics Alliance, Yangtze River Delta, Logistics Demand, Principal Component Analysis	43 ,31, 47, 40
7	Logistics Industry, Optimal Path, Human Resources Management, Internet plus, Big Data, Logistics Network, Regional Economies, Cold Chain Logistics	4 , 34, 42 ,41 ,39 ,45, 35, 33
8	ERP, The Belt and Road Initiative, Logistics Service, Logistics Finance, Cost Control	27 ,37, 22 ,25 ,13

4.3 Social network analysis of keywords

The high frequency keyword Co-word matrix is introduced into Ucinet software for data conversion, and the high frequency keyword visualization analysis is carried out with DetDraw software. Then, the atlas is adjusted by node centrality to get the atlas as shown in Figure 3.
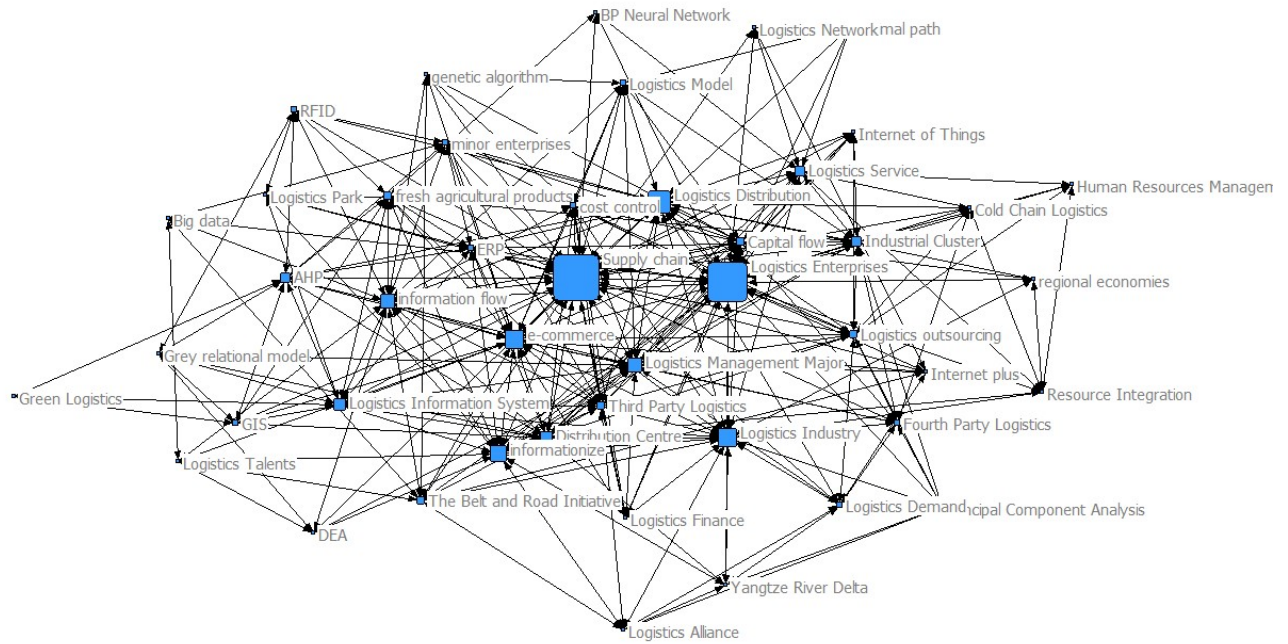
Figure 3 Social network map of high frequency keyword.

Figure 3 shows that the network density of the high-frequency keyword social network graph is 0.6605, which shows that the correlation between nodes is high, the connection is close and the aggregation is strong [7]. From the figure, we can see that logistics discipline has formed a social network chart with Supply Chain, E-commerce, Logistics Enterprises and Logistics Industry as the core. Supply Chain, E-commerce, Logistics Enterprises, Logistics Industry, Third Party Logistics, Logistics Management Major and Logistics Distribution are in the center of the whole network and are closely related, which indicates that they are hotspots in logistics research. Cold Chain Logistics, Green Logistics, Logistics Alliance, Resource Integration, Regional Economy, The Belt and Road Initiative, Logistics Network and Big Data are distributed at the edge of the network , and have little connection with the keywords in the core area. This shows that there are few studies on them at present, which is the focus and trend of logistics research in the future.

5. Research conclusions

Through the analysis of 3641 documents, the following conclusions can be drawn:

(1) The research on Logistics in China has entered a "prosperous period", with more papers published every year. Ju Songdong, Wang Yong, Li Songqing are high-yielding authors, while Ou Zhongwen, Liu Dongying, Liu Haiyan are high-cited authors, but there is no intersection between high-yielding authors and high-cited authors.

(2) Colleges and universities are the main units of logistics research. Southwest Jiaotong University, Beijing Wuzi College and Beijing Jiaotong University have more than 50 articles annually. Among the secondary units, Transportation College, Economics and Management College, Logistics College and Business College are the main research units. At the same time, these documents are mainly published in Logistics Technology.

(3) High frequency keywords are closely related and highly aggregated. Supply Chain, E-commerce and Third Party Logistics are hot topics in logistics research. Cold Chain Logistics, The Belt and Road Initiative, Big Data and Green Logistics are the focus and direction of future logistics research.

References

[1] Yin Hui, Chen Jin. Visualizing Study of China Logistics Research Issues Based on Co-word Analysis. Library and Information Service, 2011, 55(20): 129-133.

[2] Liu Jia, Li Yaman. Visualization Analysis of Hot Spot and Trend of Emergency Logistics Research Field. Journal of Wuhan University of Technology (Information & Management Engineering), 2018, 40(01): 5-11.

[3] Wang Chuanlei, Wang Jingjuan, Wu Juanhua. Visualization Analysis of Logistics Keywords Network Based on the Government Website of PRC. Journal of Anqing Normal University (Social Science Edition), 2018, 37(06): 105-115.

[4] Huang Li, Yu Shouhua, Qu Jingying Knowledge Mapping of Researches on China′s Rural E-commerce Based on Melrology Analysis with CiteSpace III. Agricultural Library and Information, 2018, 30(01): 77-83.

[5] Ou Zhongwen, Wang Huiyun , Jiang Dali.Emergency Logistics. Journal of Chongqing University, 2004(03): 164-167.

[6] Zhang Song, Liu Chengxin, Chang Yu. Selection Research of Keywords in Co-word Clustered Based on the G-index of Word Frequency--Taking Educational Technology Master Thesis as an Example. Modern Educational Technology, 2013, 23(10): 53-57.

[7] Xu Yuanyuan, Hu Xiaomei. Visualization Research on Hotspot about Logistics Management Based on Social Network Analysis. Journal of Library and Information Science, 2015, 25(21): 118-121.