



A Scientometric Analysis: The Application of Big Data in the Enterprise Supply Chain

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Abstract. Using big data analytics to deliver services to businesses is becoming increasingly popular among professionals. At the same time, the application in the supply chain is very important for practitioners. As a part of enterprises, the supply chain plays an important role in enterprises. Although many domestic and foreign researchers mainly discuss the impact of big data and supply chain on the internal environment, external environment, and the whole enterprise, few researchers have linked big data with the enterprise supply chain. Based on the 140 articles retrieved by Web of Science, this paper gives a systematic review, which provides directions for the application research of supply chain in the future, and makes up the research gap. Research papers published between 1989 and 2021 were grouped according to their source and year of publication. The results showed that in recent years, the research fields involve finance, business, management, and other disciplines. In addition, Chinese and U.S. institutions are more prominent in the field of research. In addition, big data and different keywords show important interactions in visualizations: (a) research based on big data, (b) big data and enterprise models, (c) big data and supply chains, and (d) big data and design.

Keywords: Big data · supply chain · enterprise

1 Introduction

The advent of the era of big data has brought great opportunities for the development of all walks of life. In the face of increasingly fierce market competition, more and more enterprises have realized the important role of data acquisition, analysis, screening, and application in enterprise decision management [1]. Globalization and digitalization processes are increasing customer demand for logistics costs and services. The development of logistics and supply chain has attracted wide attention [2]. The volume of data generated and communicated over the Internet is increasing significantly, thus posing challenges for organizations hoping to benefit from analyzing the massive influx of big data [3]. The traditional articles are mostly about the impact of big data and supply chains on the external, internal, and overall enterprise.

Outside the enterprise that data mining is becoming the dominant mode of production research [4]. Venkatesh Mani argues that supply chain risk management Outlines how companies can mitigate internal and external threats. Predicting and solving the

risks brought by social problems in the supply chain is very important for sustainable enterprises [5]. It is found that the frequent occurrence of destructive events makes organizations more vulnerable to obstacles, and emerging technologies can well solve supply chain problems and further improve enterprises' ability to deal with supply chain risks [6].

In enterprises, that is studied big data analysis in logistics and supply chain management in 2016 and believed that managers need to understand big data business analysis (BDBA) and supply chain analysis (SCA) as strategic assets, which should be integrated across business activities and integrated enterprise business analysis at the same time [3]. In 2021, they are used big data technology to conduct cost command and effectively solve a series of problems, such as lack of systematic analysis of cost and serious waste in sales link, to continuously improve the enterprise management level and reduce comprehensive cost [7].

In enterprises as a whole, RichardAddo-Tenkorang et al. proposed the "Big Data II" (Lot-value-Adding) framework, the purpose of which is to enable industry managers and executives to make strategic operation and management decisions ahead of time and improve return on investment (ROI). Thus, the competitive advantage of enterprises can be improved [8]. Hajar Fatorachian et al. realized a holistic approach to supply chain management through extensive supply chain integration, as well as information sharing and transparency, which greatly improved the performance of individual supply chain processes (such as procurement, production, inventory management, and retail) [9].

The informatization level and management level of enterprises are constantly improving. In the face of fierce competition, more and more enterprises have realized the important role of big data in the supply chain.

2 Data and Methods

To access the literature on big data and enterprise supply chains, we used the following Web of Science (WoS) advanced search query:

TS = ("Big Data") and TS = ("Enterprises" or "The company") and TS = ("Management" or "Application") and TS = ("Supply Chain").

A total of 140 published articles (including SCI-expanded, SSCI.) have been collected on August 1, 2021. Use VOSviewer for visual reflection.

3 Research Findings

Discuss how the application of big data in the enterprise supply chain is being studied. This article is divided into five parts to analyze.

3.1 Annual Trends

According to the data, articles on this topic have shown an increasing trend since they were published in 2014, with the number of citations increasing exponentially since 2017 and peaking in 2020. This shows that there has been a lot of interest in the subject and that interest in research is on the rise.

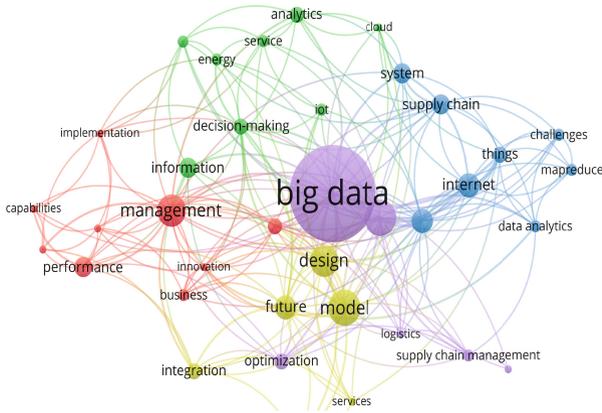


Fig. 1. Author’s keyword plus map

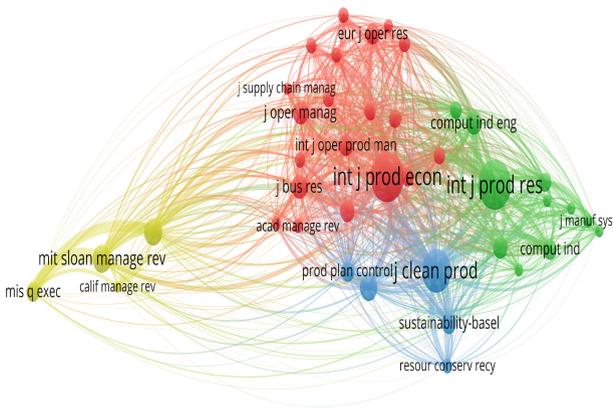


Fig. 2. Source of core citations

3.2 Keywords Analysis of Author

To discuss the relevance and intensity between items according to collinearity based on literature keywords (author keywords plus). The clustering results of the first 56 items are shown in Fig. 1.

In terms of the strength of connection with keywords, supply chain and data correspond to “management, big data, supply chain, model, decision”. The clustering analysis of keyword graph is helpful to identify five main clusters, as follows:

The red “management” cluster.

The red cluster is dominated by “management” and “performance”. As can be seen from the figure, the relevant research field is not saturated and is still a hot spot in this field. In addition, the emergence of a variety of keywords such as “business”, “predictive analysis”, “innovation”, “responsibility”, “capability” and “impact”.

The purple “Big Data” cluster.

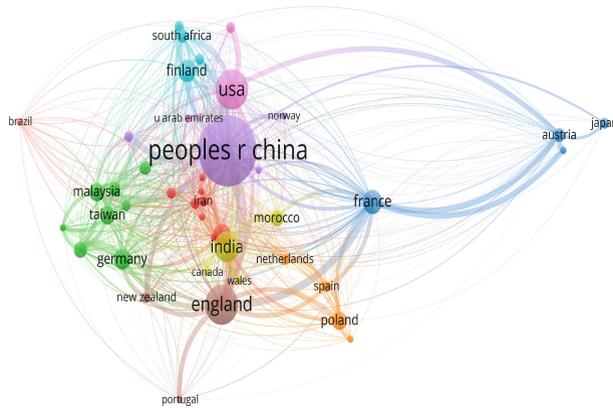


Fig. 3. Organization Chart of Core Citations

In the purple cluster, it shows the value of digitization for research. “Big data” and “systems” are the most active research. Other topics included “logistics,” “optimization,” “supply chain management,” and “Mid-sized enterprises.” Compared to the other clusters, the purple cluster has the most relevant items. It is not difficult to see that under the influence of the digital trend, the data research from a wider range of research opportunities.

The blue “supply chain” cluster.

The cluster is shown in blue. “Architecture”, “supply chain”, “internal” and “system” have greater linkage power and together form a mature research system. At the same time, the appearance of keywords such as “things” and “challenges” shows that researches on blue clusters focus on the future development of enterprises and are forward-looking.

The yellow “model” cluster.

The yellow clusters show some new keywords, including “integration,” “service,” “Design,” “forecast,” and “future.” Although these topics are relatively late in life, it is undeniable that they represent new research directions and have the potential to trigger new revolutions.

The green “decision” cluster.

The cluster is shown in green. “Logistics”, “cloud computing”, “energy”, “Technology” and “Information”. With a larger connection, the formation of a mature interdisciplinary research system.

3.3 Source of Core Citations

Figure 2 shows the results of the citation source analysis. Figure shows, The main source journals are International Journal of Production Research, International Journal of Production Economics, Journal of Cleaner Production, MIT Sloan Management Review, and four are closely related to various sources of clustering. More specifically, most of them are engineering and computer related journals. The top journals are the most important in international production engineering, followed by environmental science and management science, two of the most prominent disciplines, and environmental science and

Table 1. The article analysis

Item number	Title: Intelligent Manufacturing in the Context of Industry 4.0: A Review			
1	Main content: This article provides a comprehensive overview of the topics related to intelligent manufacturing, Internet of Things (IoT) manufacturing, cloud manufacturing, and describes the trends of intelligent manufacturing worldwide.			
	<i>Authors</i>	Zhong, RayY. etc.	<i>Publication Year</i>	2017
	<i>Total Citations</i>	596	<i>Average per Year</i>	119.2
2	Title: The future of manufacturing industry: a strategic roadmap toward Industry 4.0			
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	<i>Authors</i>	Ghobakhloo, Morteza	<i>Publication Year</i>	2018
	<i>Total Citations</i>	299	<i>Average per Year</i>	57.25
3	Title: The value of Big Data in servitization			
	Main content: Based on the established framework in the big data and service literature, this paper puts forward the strategy of big data in service for the competitive advantage of manufacturing enterprises.			
	<i>Authors</i>	Opresnik, David. Etc	<i>Publication Year</i>	2015
	<i>Total Citations</i>	221	<i>Average per Year</i>	31.57
4	Title: Big Data Analytics in Operations Management			
	Main content: This article focuses on how to apply different types of big data methods to different areas of modern operations management topics.			
	<i>Authors</i>	Choi, Tsan Ming. Etc	<i>Publication Year</i>	2018
	<i>Total Citations</i>	149	<i>Average per Year</i>	37.25
5	Title: Managing a Big Data project: The case of Ramco Cements Limited			
	Main content: This article focuses on developing a new framework and validating it with the big data project of Ramco Cement Limited Manufacturing in India to illustrate the complexity associated with the new framework for big data projects.			
	<i>Authors</i>	Dutta, Debprotim. Etc	<i>Publication Year</i>	2015
	<i>Total Citations</i>	109	<i>Average per Year</i>	15.57

(continued)

Table 1. (continued)

Item number	Title: Intelligent Manufacturing in the Context of Industry 4.0: A Review		
6	Title: Big data reduction framework for value creation in sustainable enterprises		
	Main content: This article discusses the new concept of client big data reduction, which presents a framework for early client data reduction and a business model for end-to-end data reduction in enterprise applications.		
	<i>Authors</i>	Rehman, Muhammad Habib Ur. Etc	<i>Publication Year</i> 2016
	<i>Total Citations</i>	105	<i>Average per Year</i> 17.5
7	Title: Big data and predictive analytics for supply chain sustainability: A theory-driven research agenda		
	Main content: This paper presents an agenda based on maturity theory through a literature review to stimulate people in different industries to study how big data and predictive analytics (BDPA) affect environmental and social sustainability outcomes.		
	<i>Authors</i>	Hazen, Benjamin T. etc.	<i>Publication Year</i> 2016
	<i>Total Citations</i>	104	<i>Average per Year</i> 17.33
8	Title: A framework for Big Data driven product lifecycle management		
	Main content: This article is based on a case study to demonstrate that the proposed big data-driven product lifecycle management framework can solve the challenges in big data applications.		
	<i>Authors</i>	Zhang, Yingfeng. Etc	<i>Publication Year</i> 2017
	<i>Total Citations</i>	81	<i>Average per Year</i> 16.2
9	Title: Logistics 4.0: a systematic review towards a new logistics system		
	Main content: This article provides a systematic literature review of the relevant logistics 4.0 articles, providing the possibility of unifying and extending existing solutions, as well as the possibility of identifying links and interfaces that are still needed.		
	<i>Authors</i>	Winkelhaus Sven. Etc	<i>Publication Year</i> 2020
	<i>Total Citations</i>	80	<i>Average per Year</i> 26.67
10	Title: Managerial challenges of Industry 4.0: an empirically backed research agenda for a nascent field		

(continued)

Table 1. (continued)

Item number	Title: Intelligent Manufacturing in the Context of Industry 4.0: A Review		
	Main content: Through the literature review, this paper puts forward the research agenda of empirical support, and puts forward a fruitful way for the next three basic categories of research.		
	<i>Authors</i>	Schneider, Paul. Etc	<i>Publication Year</i> 2018
	<i>Total Citations</i>	70	<i>Average per Year</i> 17.5

green and sustainable technologies. The relatively small number of economy-related journals suggests that there is plenty of room for growth in the economic field. Only a small percentage of the top 30 journals are related to business and applied MANAGEMENT, including MIS Quarterly Executive and CALIFORNIA MANAGEMENT REVIEW. These journals have a long history and considerable influence in related fields. It's worth noting that interdisciplinary research journals, Such as "Journal of Cleaner Production", "SUSTAINABILITY-BASEL", "benchmarking" AND "TECHNOLOGICAL FORECASTING AND SOCIAL" "CHANGE" also accounts for a large proportion.

3.4 Top Published Countries

Geographical distribution is another way to distinguish the relationships between clusters, which is manifested mainly in the intensity of the center of field research. It represents the extent to which the different scientific groups that are part of the center come together, reflecting the concept of "collision" among the scientific members of the science center. The dominant countries in Fig. 3, from top to bottom, include China, England, the United States, and India. The cluster in Fig. 3 shows a more distributed trend, i.e. these results confirm that big data analysis and supply chain research perspectives are diverse, with no particularly stable research center.

3.5 Analysis of Important Articles

In terms of content, it can be roughly divided into three parts: enterprise internal, enterprise external, enterprise as a whole. The enterprise is involved in big data analysis, client big data reduction, big data and predictive analysis, management. Outside the enterprise, intelligent manufacturing and optimized product lifecycle management are mentioned. As a whole, the enterprise mentioned the industry 4.0 transformation strategy roadmap, the big data strategy in the service, and the logistics 4.0 framework. These articles have made research on the development of enterprises from different angles, and have certain reference value for the development of enterprises (Table 1).

4 Conclusion

The important conclusions of this paper are as follows:

- 1) At present, domestic and foreign researches focus on the specific impact of big data and supply chain on enterprises. Enterprises should pay full attention to the research topics of big data and supply chain application
- 2) The main Research Journal is International Journal of Production Research
- 3) The main research countries are China, England and the United States

To sum up, big data plays an important role in all aspects of enterprise supply chain management. However, China, the United States, and other countries are likely to continue to form the key organizations and collaborative systems in the field, with the scope of existing research, to enable big data to play a powerful role in the management of enterprise supply chains.

As our scientific analysis shows, relying on the application of big data in the supply chain will make it easier for enterprises to complete the connection of the whole supply chain. Whether it is supply chain or enterprise management, big data technology will usher in a new era and open up a new path for global economic growth.

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