

Visual Analysis of Hot spots and Trends in China's Vendor Managed Inventory Research

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Abstract

Based on the research literature on China vendor managed inventory from 2000 to 2024, CiteSpace software was used to carry out visual bibliometric analysis of knowledge graphs such as keyword co-occurrence and clustering, and to explore the research hotspots and trends of supplier management inventory in China. It is found that the hot topics of domestic supplier management inventory research mainly include supplier management inventory and information sharing re-search, operation optimization research, and interest coordination research, and the research has gone through three stages: initial exploration period, growth period and comprehensive development period. Finally, it is proposed that in the field of supplier management inventory in the future, it is urgent to focus on the combination of green supply chain and digital intelligence, and explore the application of new technologies and models.

Keywords

Vendor managed inventory; CiteSpace; Hot research topic; Research trend

1. Introduction

Inventory management in the supply chain is the basic factor to achieve economic balance. It requires the parties to negotiate, integrate, and coordinate at the supply chain level. The traditional inventory model is no longer suitable for practical requirements. Vendor-managed inventory (VMI) is an integrated strategy that aims to achieve the lowest cost. The supplier manages the inventory under the mutual agreement between the user and the supplier, constantly supervises the agreement's implementation, and modifies the agreement's content so that inventory management can be continuously improved[1].

In the past two decades, scholars in China have carried out extensive theoretical and practical discussions on the implementation mode, interest coordination, and optimization of VMI. Based on combing the core journal literature of China's vendor managed inventory from 2000 to 2024, this paper aims to explore the research hotspots and trends of vendor-managed inventory from the aspects of publication

volume analysis, keyword co-occurrence analysis, cluster analysis, and time zone map with the help of CiteSpace software, to provide a reference for the future research direction of vendor managed inventory.

2. Data Sources and Research Methods

2.1. Data Sources

The literature data studied in this paper come from the academic platform of China National Knowledge Infrastructure (CNKI). The main categories are ' Peking University Core ', ' CSSCI ', and ' CSCD '. The period of the literature is from 2000 to 2024, and the retrieval time is February 16, 2025. The specific retrieval process is as follows: 1) Using the advanced retrieval function of CKNI, with ' vendor managed inventory ' as the subject word retrieval, 2) Read the abstract of the literature, and eliminate the literature that is not related to the vendor managed inventory, 3) Eliminate meetings, news and literature without keywords. The literature was imported into CiteSpace for deduplication. Finally, a total of 237 valid literatures were obtained.

2.2. Research Methods

The scientific knowledge graph takes the knowledge domain as the object, showing the development process of scientific knowledge and its structural relationship. It has two properties and characteristics of graph and spectrum. It is not only a visual graph, but also a serialized knowledge pedigree, which is convenient for researchers to understand the complex relationship contained in the knowledge unit and breed new scientific knowledge[2]. This paper adopts the method of scientific bibliometric analysis and uses CiteSpace software to draw and interpret the scientific knowledge map of domestic vendor managed inventory research. On this basis, explore the possible research status and hot spots.

3. Research Status of Vendor Managed Inventory

3.1. Trend Analysis of the Time of Issuance

The number of papers published can judge the importance and attention of social subjects to this research field. Based on the literature data of China 's Vendor Managed Inventory, this paper draws the distribution map of the year of departure, as shown in Figure 1. It can be seen from Figure 1 that with the development of supply chain management theory and practice around the world, China has gradually attached importance to the application of supply chain management ideas. In 2000, Chinese scholars Zhao and Li[3] first studied the implementation model of vendor managed inventory. From 2003 to 2015, although the number of published papers fluctuated, it still showed an increasing trend. Among them, the growth rate of published papers from 2005 to 2006 reached a peak, and the number of papers in 2006 and 2008 reached 22, indicating that this period was a period of rapid development

of vendor managed inventory research in China. From 2016 to 2024, the average number of publications was 3.8, and the increment showed a slowing trend.

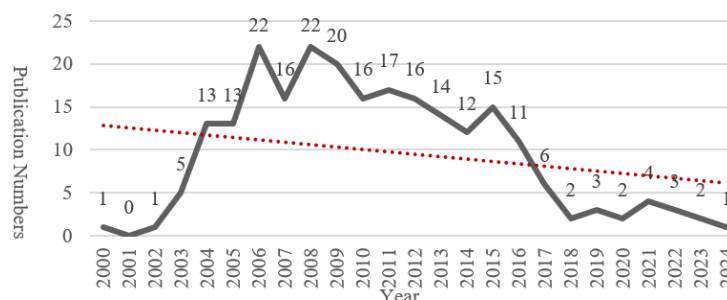


Figure 1. Annual volume of vendor managed inventory from 2000 to 2024

3.2. Keywords Co-occurrence Analysis

Keywords are highly concise and concentrated summary of the content of literature research. Co-occurrence analysis analyzes the number of keywords appearing in the same article. In the CiteSpace software, the following parameters are set : the node type is the keyword, the time span is 2000-2024, the time period slice is ' 1 ', the routing network algorithm is used to simplify the network structure and highlight the important structural features. The node threshold is set to ' 4 ', that is, only keywords that appear more than 4 times are displayed, and the keyword co-occurrence network map is obtained as shown in Figure 2. The nodes in the knowledge graph are represented by a circle, each node represents a keyword, and the number of nodes N represents the number of keywords; the size of the circle represents the frequency of the keyword in the network, and the keywords with high co-occurrence frequency can be used as a research hotspot in the field of vendor managed inventory. The connection between different keywords represents the co-occurrence intensity between keywords, and the more connections, the greater the intensity.

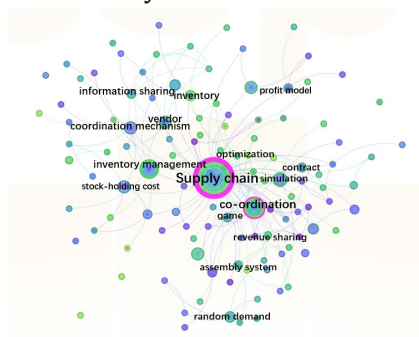


Figure 2. Keywords co-occurrence map of vendor managed inventory literature

Table 1 shows the word frequency statistics results of hot keywords in the field of domestic vendor managed inventory research. The top 10 keywords are: supply chain coordination, inventory management, information sharing, revenue sharing,

etc., which are hot research issues in the field of vendor managed inventory in China in recent years. The theoretical methods may include game theory, system dynamics and simulation example analysis.

Table 1. Hot keywords in the field of vendor managed inventory

Ranking	Count	Centrality	Keywords
1	66	0.49	supply chain
2	12	0.12	co-ordination
3	12	0.06	inventory management
4	8	0.05	simulation
5	6	0.02	information sharing
6	6	0.06	inventory
7	5	0.05	revenue sharing
8	5	0.03	random demand
9	5	0.02	win-win
10	5	0.03	bullwhip effect

3.3. Keywords Clustering Analysis

In order to more effectively identify the specific research areas and contents of vendor managed inventory, the research in this paper is further based on the ' LLR ' clustering algorithm in CiteSpace software to cluster the keywords. As shown in **Figure 3**, a total of 7 keyword clusters are formed, including supply chain, coordination, information sharing, random demand, integrated replenishment, inventory, coordination mechanism and inventory strategy. The research focus of vendor managed inventory in China for more than 20 years can be divided into the following three categories: 1) Research on vendor managed inventory information sharing; 2) Vendor managed inventory operation optimization research; 3) Research on benefit coordination of vendor managed inventory.

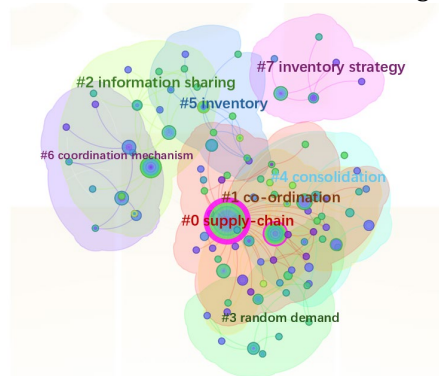


Figure 3. Inventory managed inventory literature keyword clustering diagram

4. Vendor Managed Inventory Research Process Analysis

On the basis of keyword cluster analysis, the keyword co-occurrence map of China 's vendor managed inventory research is transformed into a time zone map (**Figure 4**), and

the nodes in the same time point are set in the same time range to understand the changes of vendor managed inventory hot topics in different periods. Combined with **Figure 4** and **Figure 2**, the study of vendor managed inventory in China can be divided into three main stages of evolution.

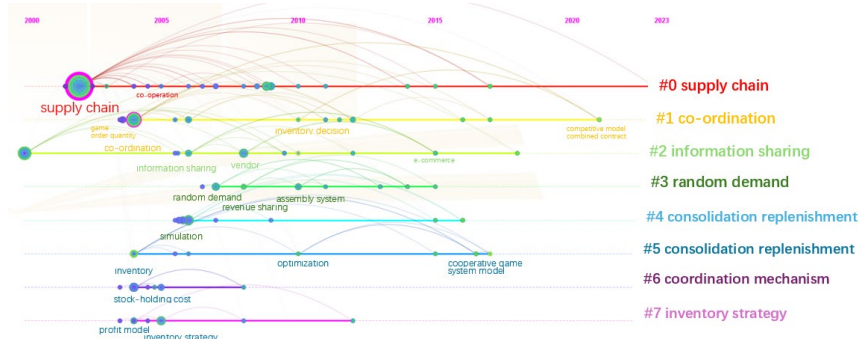


Figure 4. Inventory managed inventory literature keyword co-occurrence time zone map

4.1. Preliminary Exploration Period: 2000-2005

After China 's accession to the WTO, the supply chain complexity of Chinese enterprises has increased, and the demand for inventory efficiency has increased. The research literature in this period mainly has the following aspects: First, consider establishing a vendor-managed inventory operation model that meets different product needs and industry characteristics. Li[4] discussed some key issues of the implementation of vendor managed inventory in China 's manufacturing enterprises. Cui and Chen[5] studied and established a VMI model suitable for the characteristics of aquatic products that are not easy to store, easy to corrupt and deteriorate, and short inventory cycle. The second is to consider the cost control and profit analysis under the vendor managed inventory model. Xu and Chen[6] found that the total inventory cost of the whole supply chain decreased and the buyer 's profit increased, while the supplier 's inventory cost increased and the profit decreased by analyzing the cost and profit of the members of the supply chain such as suppliers and buyers in the initial implementation stage of VMI.

4.2. Growing Period: 2006-2015

The rise of e-commerce and new retail promotes the real-time and accurate development of supply chain. The research in this stage focuses on the following aspects: First, VMI model and information sharing. Zhang[7] studies have shown that time-based VMI integration replenishment can effectively reduce the bullwhip effect. Liu[8] et al. found that for retailers and the entire supply chain, the information sharing model is superior to the traditional model, and the vendor managed inventory model is superior to the information sharing model. Second, the design of interest coordination mechanism under VMI mode. Zhang [9] et al. found that after the implementation of VMI model, the total inventory-related costs of the supply chain will decrease in the short term, while the supplier-related inventory costs will in-

crease. However, when the supplier's sales price changes within a reasonable range, the economic profits of suppliers and retailers can be improved at the same time, so as to achieve a win-win situation. Third, the optimization of inventory transportation model under VMI mode. Xie[10] et al. studied the integrated optimization model of inventory and transportation in which a supplier and multiple retailers have a common order replenishment period and the demand obeys the Poisson process.

4.3. Comprehensive Development Period: 2016-Present

The research on vendor managed inventory at this stage continues the previous research perspective, covering the following aspects: First, consider the inventory management model of third-party logistics and outsourcing participation. Wang [11] et al. introduced the third-party logistics into the vendor managed inventory model, and constructed the third-party logistics managed inventory model (TMI). Combined with the system dynamics model, the TMI operation framework and process were analyzed. It shows that TMI reduces the inventory level of suppliers and systems, helps to smooth the supplier's production process, and helps to improve customer service levels. Feng[12] et al. studied the impact of the introduction of new inventory management models such as vendor managed inventory and consignment on the operation and contract design of the production, transportation and marketing supply chain system under the condition that both suppliers and demanders jointly outsource logistics to third-party logistics service providers. The second is VMI research considering market factors such as consumer behavior, brand and price effect. Lan [13] introduced customer balking behavior into VMI supply chain with promotional efforts, and explored the coordination of VMI supply chain with customer balking behavior and promotional efforts. Xin [14] et al. studied the influence of customer price memory effect on inventory path and pricing optimization under VMI mode.

5. Conclusions and Prospects

5.1. Conclusions

On the basis of combing the core journal literature of vendor managed inventory research from 2000 to 2024, this paper analyzes the research hotspots and trends by drawing a visual knowledge map. The analysis results show that: 1) Through the analysis of keyword co-occurrence map and high-frequency keywords, it can be seen that supply chain coordination, inventory management, information sharing and revenue sharing are the main research hotspots, 2) It can be seen from the results of keyword cluster analysis that there are seven clusters: supply chain, coordination, information sharing, random demand, integrated replenishment, inventory, coordination mechanism and inventory strategy, 3) From the perspective of the overall research stage, the publication of literature in the field of vendor managed inventory in China shows a fluctuating trend, and the growth rate of publications

increases first and then decreases. Combined with the analysis of keyword co-occurrence map and time zone map, the domestic vendor managed inventory research is divided into three stages: preliminary exploration stage, growth stage and comprehensive development stage.

5.2. Prospects

By sorting out the research hotspots of VMI and combining the research status and deficiencies in related fields, the future development and research of VMI can be carried out from the following aspects: 1) The research draws more on foreign theories, and needs to fully consider China 's special business environment, such as interpersonal relationships, trust mechanisms, and policy factors, 2) Green supply chain and vendor managed inventory. With the popularization of the concept of green development, the application of VMI in green supply chain has become a new research direction. This paper discusses how VMI can realize the coordinated development of resource conservation and environmental protection, and promote the implementation of green VMI, 3) Supply chain intelligence and vendor managed inventory. The wide application of cloud computing, big data and artificial intelligence technology provides good conditions for VMI innovation and development. In the future, it can be discussed how VMI can be deeply integrated with the construction of supply chain intelligence, which has become the key to improving its efficiency and competitiveness.

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