

# Collaborative Innovation Research on Manufacturing Supply Chain: A Review Literature

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## Abstract

The literature analysis method is used to summarize and analyze the relevant research in the field of manufacturing supply chain collaborative innovation at home and abroad, and conclude that it is necessary for manufacturing supply chain collaborative innovation, which can improve the supply chain response speed while improving The level of product innovation enhances the positive impact of product added value. Achieving efficient, coordinated, and sensitive manufacturing supply chains has become the key for manufacturing to maintain a high foothold in market competition, so manufacturing companies must strengthen their tacit cooperation with suppliers and retailers to improve manufacturing The transparency of process information and the high degree of synergy achieve traceability of information to improve the level of collaborative innovation in the entire manufacturing supply chain, and ultimately achieve the purpose mentioned by customer satisfaction. Finally, the current research is prospected. Most of the studies that have separately analyzed supply chain collaboration, supply chain performance, and supply chain collaboration influencing factors. There are relatively few comparative studies on the level of collaborative innovation in the manufacturing supply chain. Turn to enhance the level of collaborative innovation and ability to explore manufacturing supply chain research.

## Keywords

Manufacturing; supply chain; supply chain management; collaborative innovation.

## 1. Introduction

Nowadays, the economic globalization situation has become increasingly prominent and increasingly complex. As an important lifeline of China's economic development, the manufacturing industry shoulders the important mission of national industrial development and national defense construction. In the future, how the manufacturing industry will gain industrial advantages is no longer a competition between single enterprise manufacturing but a competition between manufacturing supply chain and supply chain. For a long time, China's manufacturing supply chain coordination level is still lacking in developed regions, facing various problems including internal and external. The low internal data utilization rate, inaccurate and untimely results in the inability to share information and data within the manufacturing enterprise; inefficient and irregular process management can no longer adapt to the current era of intelligent digitalization; the weak awareness of collaboration among enterprises on the chain and The lack of strategic thinking leads to the lack of perfect management system. External problems are still facing the artificially high cost of labor and the rise of principle costs, which undoubtedly cause a large cost burden for enterprises throughout the manufacturing chain. Nowadays, the fierce competition in the industry makes the manufacturing industry must carry out the intelligent development and innovation of the supply chain. The supply chain will also become an important engine to promote the transformation of traditional manufacturing to smart manufacturing. Through collaborative

innovation to break down the barriers to cooperation between supply chain collaboration processes, and after the establishment of core enterprises, the effective integration of manpower, material resources, capital, and technology will fully release the role and driving force of supply chain collaborative innovation, so as to achieve the promotion of manufacturing supply chain The development of collaborative innovation. Therefore, exploring the advantages of manufacturing innovation, manufacturing supply chain collaborative innovation and supply chain collaborative innovation level is a research topic of great significance.

## 2. Literature Review

### 2.1. Domestic Research Review

#### 2.1.1. Research on Manufacturing Supply Chain

Domestic and foreign research on manufacturing supply chain mainly focuses on three aspects: manufacturing supply chain management research, manufacturing supply chain performance research, and manufacturing supply chain risk research.

Research on manufacturing supply chain management. Wang Lijie et al. (2014)[1]took the three-tier manufacturing supply chain as the research object, and explored the low-carbon management awareness of the managers and the manufacturing supply chain structure as the influencing factors that affect the carbon emissions of the manufacturing supply chain to explore the manufacturing industry. Supply chain management strategies to achieve a multi-level carbon footprint optimization path. Xie Haitao et al. (2015)[2]analyzed the collaborative characteristics of forestry supply chain with the characteristics of supply chain collaboration as the analysis framework. The research shows that it is necessary to pay attention to the organizational structure of multi-level organization, highly decentralized forest management entities, natural systems, The social system is characterized by mutual benefit and symbiosis and the dominance of core enterprises. Sun Jianhui et al. (2018)[3]conducted differential empirical research by using Nash non-cooperative games and Stackelberg master-slave games from the perspective of differential game theory in the supply chain management and coordination of the three-level equipment manufacturing industry. Yang Xin et al. (2019) [4] proposed a cloud manufacturing supply chain by comprehensively comparing the optimal carbon emission reductions, optimal pricing and overall supply chain profit of the cloud manufacturing supply chain under the decentralized and centralized decisions of manufacturing enterprises Coordination mechanism for environmental governance. Empirical analysis is carried out using the Stackelberg game model and the demand function under the influence of price and carbon emission reduction.

Research on manufacturing supply chain performance. Qi Xugao (2013)[5]built a theoretical model influencing manufacturing supply chain collaborative product innovation based on the theoretical analysis of manufacturing supply chain collaborative product innovation. After empirical analysis of the model with 174 empirical survey data, the final The synergy effect of product innovation in the supply chain is significantly affected by the perfection of corporate cooperation, product knowledge barriers and incentive mechanisms, but it has no significant impact on the strength of innovation resources, collaborative product innovation platforms and corporate compatibility levels. Yang Jin (2014)[6]takes the supply chain of China's aerospace manufacturing industry as the research object, constructs a theoretical model of supply chain network embedding and supply chain performance, and draws a significant impact on the supply chain performance of large and complex product manufacturing industries, using empirical analysis To explore the mechanism of China's aerospace manufacturing supply chain network embedding on supply chain performance. Yang Jin (2015)[7]explored the effect and mechanism of network relationship embedding on the synergy of high-end manufacturing supply chain synergy through the aviation manufacturing supply chain as an example, using

hierarchical regression analysis to obtain network relationship embedding for high-end manufacturing supply chain synergy Ability has an obvious positive effect in all dimensions. Zhou Maosen et al. (2017)[8]through the research on supply chain management of complementary product manufacturing, deeply proposed the manufacturer's information sharing mechanism and incentive mechanism and then designed the information sharing incentive mechanism, using the dynamic game model under incomplete information to solve the game Equilibrium model.

Research on manufacturing supply chain risk. Zhu Jiayang et al. (2012)[9]verified the manufacturing supply chain cost model based on the deferred policy by applying calculation examples, and concluded that when a certain level of reference parameters were reached, the cost of the supply chain cost before the deferred strategy was implemented was significant. After implementation of the postponement strategy. Wang Xiaoli et al. (2013)[10]used the third-party logistics service remediation process investment, structural investment, cooperative service remediation subject willingness and cooperative service remediation timing as decision variables to construct an optimal mathematical model of remediation decision costs for each participant in the entire system. The author finds the optimal remediation strategy for the system to remediate the expected target cost. Shi Liping et al. (2014) [11]based on the role of supply chain partner attitude commitment to supply chain vulnerability as a theoretical basis, using 252 small and medium-sized manufacturing companies as their research objects, using multiple intermediary effect verification models to verify the disappointment attitude commitment between supply chain partners The rationality of the intermediary variables of the brittle relationship with the supply chain. Yu Fengyan et al. (2017)[12]used the US foreign trade policy as a basis to study the current trends and risks of global manufacturing supply chain manufacturing. In the context of global supply chains, the implementation of trade protectionism in the United States may ultimately result in its own economic losses. Li Feng et al. (2019) [13] studied the impact on China's manufacturing supply chain from the perspective of Sino-US trade friction, and had a significant impact on China's export-oriented and foreign-invested manufacturing supply chains, resulting in adverse effects on China's manufacturing exports and product institutions. Build an independent and controllable supply chain system based on the integration of domestic and foreign resources in China in the medium and long term.

### **2.1.2. Research on Collaborative Innovation**

Research on the scope, model and influencing factors of collaborative innovation. Ma Hui et al. (2018)[14]combed through literature research to build a social network analysis model while using UCINET6 software analysis to study the factors affecting the collaborative innovation of the construction industry alliance. Sun Rongzhen (2019)[15]summarizes the motivation of low- and medium-tech companies for collaborative innovation through the use of "seeking brand blessing", "reducing the risk of R & D activities" and "acquisition of synergistic surplus". Two different collaborative models. Jiang Kaidong et al. (2020)[16]analyzed the practice model generated by the symbiosis theory when embedding the collaborative innovation model in colleges and universities with the symbiosis theory as the theoretical basis, and on this basis constructed a well-ordered system of collaborative innovation symbiosis and a collaborative innovation organization form 3. Build a regional mutualistic symbiosis platform and propose an optimized path selection for collaborative innovation model of colleges and universities to comprehensively improve the level and ability of collaborative innovation in colleges and universities. Jiang Man et al. (2020)[17]took the emerging industry of intelligent robots in China as an example and used collaborative innovation as the starting point to construct a technology opportunity recognition model from the main body of technology, environment and innovation, and discussed it using a patent network. This model provides a reference for industrial technological innovation and regional collaborative innovation decisions.

Research on the performance and path selection of collaborative innovation. Jiang Xinghua (2018)[18] conducted an empirical study on scientific researchers through the use of multiple regression models and found that collaborative innovation performance and personnel management, collaborative mechanisms, and partner conditions have a positive impact and positive regulatory effect. Liu Wenxia et al. (2019)[19] based on social exchange theory and knowledge management theory, took 178 effective data of multi-regional enterprises as the research object and empirically tested it using multiple regression to explore inter-enterprise trust and collaborative innovation performance of service outsourcing enterprises Mechanism and boundary conditions. Liu Jianhua et al. (2020)[20] analyzed the main users of universities, core enterprises, government, finance, intermediaries, etc. in the process of collaborative innovation and proposed an analysis framework of "structure-power-performance". Analyze the dynamic factors of strategic emerging industries and the performance of strategic emerging industries from different aspects. Using Japanese new energy vehicles as an example, an empirical analysis of the "structure-power-performance" framework is conducted to provide constructive suggestions and countermeasures for the development of China's strategic emerging industries and improve new development directions.

Research on the areas of collaborative innovation, industry, university and research. Zhu Jian et al. (2018)[21] based on the case study of the Industrial Collaborative Innovation Center of Hunan Province in 2014, proposed the establishment of a collaborative innovation incentive policy, collaborative innovation mechanism and output performance transmission mechanism. Xiao Xingzheng et al. (2019)[22] built a collaborative innovation system based on the four-link nature through a literature analysis method to act on a new model of talent training in vocational colleges. It also puts forward constructive suggestions and countermeasures for collaborative innovation in vocational colleges, and strives to form a new concept of collaborative innovation model of "government guidance-enterprise leading-scientific research creation-college innovation", through which to promote the healthy and orderly development of vocational colleges. Li Lin et al. (2020)[23] studied the influence of government intervention mechanism on the collaborative innovation model of industry, university and research institute by constructing structural equation model and multiple regression model, and considered the existence of the government intervention mechanism and the collaborative innovation mechanism of industry, university and research institute. Relationship and influence path, it is concluded that the government intervention mechanism has varying degrees of impact on the operation mechanism of collaborative innovation of industry, university and research institute, and the degree of review strength directly leads to the conclusion of the success degree of collaborative innovation project. The optimal relationship matching table is to improve the constructive suggestions and basis of collaborative innovation projects.

### **2.1.3. Research on Collaborative Innovation of Supply Chain**

The domestic and foreign researches on supply chain collaborative innovation mainly focus on two aspects: supply chain collaborative innovation management model and supply chain collaborative innovation performance research.

Research on supply chain collaborative innovation management model. Tian Wei (2012) [24] through the construction of a model of the collaborative innovation game process of three modes of suppliers, manufacturers, and third-party R & D institutions, it is found that when the innovation capability is at a considerable level, the downstream collaborative innovation model is improving the overall supply. At the same time, the level and intensity of chain innovation can reduce its own investment risk in innovation. Chen Gezhi (2017)[25] mainly takes the tourism supply chain as the starting point for research, analyzes and studies the signing of legal contracts to introduce external mandatory legal constraints and build relationship norms, so as to achieve the governance effect of two mechanisms of autonomous constraints within the group. Tan Lingling (2018)[26] by building a "one manufacturer and two retailers" supply chain

collaborative innovation knowledge sharing game model to the retailer's fair preference and vertical fairness preference for the supply chain knowledge sharing collaborative innovation equilibrium strategy. A comparative study of the impact was conducted, and the results of the results were analyzed by numerical simulation and analysis.

Research on the performance of supply chain collaborative innovation. Zhang Yinghua et al. (2016)[27] explained the connotation of supply chain coordination and performance with the relevant connotation of supply chain collaborative performance as the starting point of the study. After building an integrated supply chain collaborative performance evaluation index system, the trapezoid fuzzy number similarity evaluation method was used. Empirical Research. Qiu Hongquan (2017) [28] conducted an empirical analysis of the impact of the dual-channel supply chain collaborative innovation mechanism system on the innovation performance of current logistics services in 224 agricultural product manufacturing companies in Fujian, Guangdong and Zhejiang, while simultaneously examining the regulatory effect of environmental dynamics. The results of the study clarify the mechanism, impact path and environmental intervention of the dual-channel supply chain collaborative innovation on the performance of logistics services.

## **2.2. Overseas Research Review**

### **2.2.1. Research on Manufacturing Supply Chain**

HUSSEIN et al. (2016)[29] aimed at the seamless integration of data and information in the internal production process, researched and investigated the use of ERP-based systems, and proposed an ERP-based method for quality control and assurance work. Application case study. ZHANG Huiying et al. (2017)[30] built a manufacturing chain network and analyzed three relationship structures between suppliers with different relationship densities, and then established a two-party revenue matrix to analyze two-party games and evolution Stability strategy. The numerical simulation verifies the evolutionary stability strategy of the two parties under different income parameters. Wen Wang et al. (2018)[31] established a high-dimensional piecewise linear dynamic model for the supply chain system by describing how the ordering strategy affects the complex dynamic behavior patterns and operating costs in the general discrete manufacturing supply chain system. Five combinations of ordering strategies are considered. Moosivand Asiye et al. (2019)[32] studied and explored the challenges of the pharmaceutical supply chain (PSC) and the dynamic behavior of variables that play a special role in the PSC, using qualitative system dynamics methodology to prove the interrelationship between the variables that affect the challenge. To come up with the supplier's cooperative relationship, investment in new technologies and the establishment of information technology (IT) strategic policies. Shishir Goyal et al. (2020)[33] studied different environmental loss factors in the steel manufacturing supply chain and identified important factors. TLF and DOE are used to compare the environmental losses in different situations and estimate their comprehensive contribution to important factors. Provide directions for comparative environmental performance assessment of the general manufacturing and steel industries. It determines the individual performance of each environmental loss factor and its combined impact.

### **2.2.2. Research on Collaborative Innovation**

Taking the basic theory as a starting point, Schumpeter et al. (1912)[34] for the first time attributed the word "innovation" to "reorganization of the factors of production by entrepreneurs", which marked the beginning of research on innovation theory. As one of the innovation methods, collaborative innovation aims to achieve the maximum results of innovation. Ansoff (1957)[35] put forward the concept of "synergy" for the first time. The symbiotic relationship based on resource sharing and mutual benefit and win-win between enterprises is collaboration, and the integration of collaboration makes the overall value of the

enterprise far exceeds its single value. Perkmann et al. (2013)[36]found that collaborative innovation has gradually become a hot issue in academia since 2005 by searching on the keywords of “industry-research institute” and “collaborative innovation”. Hemmert (2014) [37] It is proposed that industry-university-research cooperation should be gradually strengthened in the cooperation of enterprises, universities, and research institutes. Maietta (2015) [38] systematically analyzed research universities in manufacturing while studying the main factors of collaborative innovation in the low-tech manufacturing industry the main factor of business cooperation.

### 2.2.3. Research on Collaborative Innovation of Supply Chain

Erol et al. (2011)[39] used fuzzy entropy and fuzzy multi-attribute corresponding theory to determine indicator weights and performance evaluation of sustainable supply chains. Cifci et al. (2011)[40]adopted the ANP research method to select suppliers in a sustainable supply chain under multi-person decision-making. Yakovleva (2012)[41] builds on the TBL theory as the basic theory to build a sustainable supply chain performance evaluation index for the food manufacturing industry, taking into account the economic, environmental and social aspects. Pagell et al. (2014) [42] believe that manufacturing companies should continue to pay attention to the impact of their own internal and supply chain operation management on the ecological social system while ensuring their own interests and profits, and should not affect the social environmental system. Tseng et al. (2015)[43]based on the BSC theoretical framework, used fuzzy Delphi method and ANP research method to judge the performance of sustainable supply chain. The research has obtained from four aspects of sustainability, internal management, learning communication and interest-related Said market share, cost savings in the supply chain, corporate environmental strategic planning, and green are important factor indicators. Motevali et al. (2016)[44]proposed a hybrid DEA-BSC model to evaluate the sustainable supply chain performance of plastic recycling-related companies. Mohammad (2018)[45]uses a new stochastic two-stage DEA model to evaluate the sustainability of the supply chain.

## 3. Research Review

In summary, Supply chain collaboration, supply chain innovation and the upgrading and development of the supply chain model of the manufacturing industry have been widely recognized by scholars at home and abroad. most of the existing studies have separately analyzed the supply chain coordination, supply chain performance, and supply chain coordination influencing factors. There are relatively few comparative studies on the status quo of manufacturing supply chain collaborative innovation, from improving the level of collaborative innovation. From the perspective of capability and ability to explore the manufacturing supply chain research is still blank. In the future research, we can try to reveal the current manufacturing mode in China through the analysis of the manufacturing supply chain mechanism and the supply chain collaborative innovation. The current situation and reasons for the development of collaborative innovation in the industry supply chain, combined with time cross-sectional data and structural equations for comparative research, put forward countermeasures and suggestions for the development of collaborative innovation in the manufacturing supply chain. Expect to maximize the promotion of industrial upgrading and innovative development mode of manufacturing through the perspective of supply chain collaborative innovation, in order to jointly promote the development of manufacturing supply chain and collaborative innovation level, and then promote the development of China's supply chain comprehensive collaborative innovation era wave.

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