

Effect of Supply Chain Innovation on Enterprise Operational Performance under the Perspective of Collaborative Management

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Abstract: The advent of the digital economy era makes enterprises face more and more complex and dynamic environments, and each field presents the phenomenon of multi-factor complex interaction. Therefore, implementing a supply chain innovation strategy is an inevitable trend for developing China's manufacturing enterprises under the background of rapid technological and product upgrading. Currently, supply chain innovation under the perspective of collaborative management has become a research hotspot in the field of the manufacturing industry. This paper analyzes the supply chain innovation of enterprise operational performance under the collaborative management mode. It explores the influence path of supply chain innovation on the operational performance of manufacturing enterprises.

Keywords: Collaborative management; Supply chain innovation; Enterprise operational performance.

1. Introduction

A strong supply chain management capability is a distinctive feature of world-class enterprises, which is an important condition for enterprises to occupy the high point of global market competition and control the initiative. In the list of "The World's 250 Largest International Contractors" published by the U.S. Engineering News-Record (ENR) in 2022[1], one of the common characteristics of ACS and Xavier Huillard, which are at the top of the list, is that they attach great importance to procurement and supply chain management. In the past decade or so, no matter facing the global financial crisis, undercapitalization, the impact of the COVID-19 pandemic, or the increase in the price of crude oil and other commodities. These enterprises have always been able to adjust their supply chain system according to their needs, thus enabling them to face risk, keep their elasticity, resilience, and stability, and be invincible in global competition. Therefore, giving full play to the supply chain information integration capability, collaborating with upstream and downstream enterprises, knowledge sharing,

and technical cooperation has become a necessary way for Chinese manufacturing enterprises to improve their performance.

2. Supply Chain Concepts and Characteristics of Manufacturing Enterprises

2.1. Supply chain concepts

Supply chain refers to the functional network structure that connects suppliers, manufacturers, distributors, and users into a whole around the core enterprise. It starts with the supporting parts and makes the supporting parts into intermediate products and final products. Finally, the sales network delivers the products to the consumers. The business philosophy of supply chain management is to seek the global optimization of the supply chain from the consumer's point of view and collaboration between enterprises. Moreover, successful supply chain management can coordinate and integrate all the activities in the supply chain. Finally, it results in a seamless and integrated process.[2]

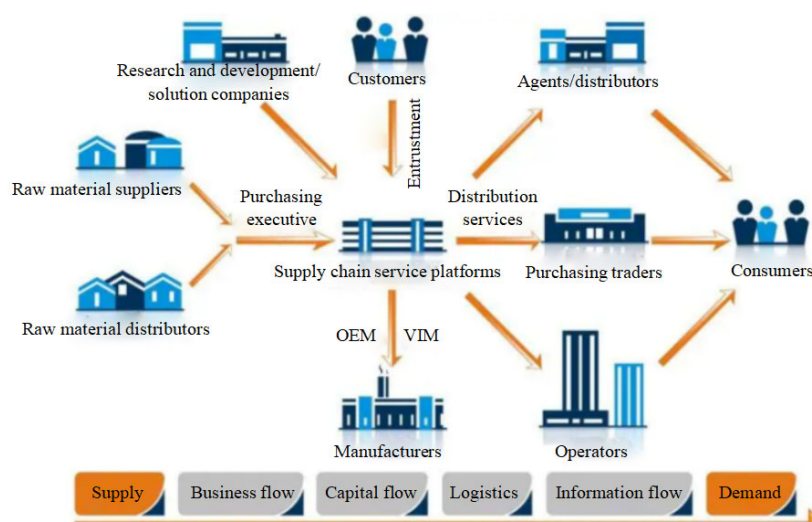


Figure 1. Supply chain structure diagram

2.2. Supply chain characteristics

2.2.1. Complexity

The supply chain covers many kinds, types, and geographic areas of enterprises. Compared with individual enterprises, the supply chain is more complex in terms of structure, scale, management mode, and many other aspects.[3]

2.2.2. Customer-oriented

In the operation process of the supply chain, the supply chain under the guidance of the plan to achieve the integration of the "four flows" are based on the end of the demand pull, which all are to meet the end-customer demand as the goal.

2.2.3. Dynamic

Due to the market environment's complexity and variability, supply chain enterprises need real-time dynamic updates to adapt to the changing environment and achieve the overall optimization of the supply chain.[4]

2.2.4. Intersectionality

A node enterprise in a supply chain may provide product services to node enterprises in multiple supply chains, thus forming the characteristic of many supply chains intersecting with each other.[5]

3. How Supply Chain Innovation Affects the Operational Performance of Manufacturing Enterprises

Currently, China's manufacturing industry is developing towards large-scale, precision, numerical control, and full-automatic. Therefore, traditional manufacturing enterprises need to establish an effective connection between the manufacturing process and the product design, distribution, operation, maintenance, recycling, etc. To transform the "information island" into information-based collaborative management and effectively improve production efficiency.[6] Additionally, establishing the network collaborative manufacturing platform can be used to coordinate the information interaction between the enterprise and the enterprise, as well as between the enterprise and the user, to achieve networked resource sharing and work collaboration. Through relationship coordination, information sharing, and joint participation with suppliers, customers, and other key members of the supply chain. The enterprise can promote the smooth circulation of information flow, capital flow, logistics, service flow, and value flow in the supply chain to achieve the purpose of providing customers with maximum value at low cost and high efficiency. It can effectively solve the problem of inter-organizational information asymmetry, reduce the enterprise's transaction cost and improve the enterprise's operational performance.

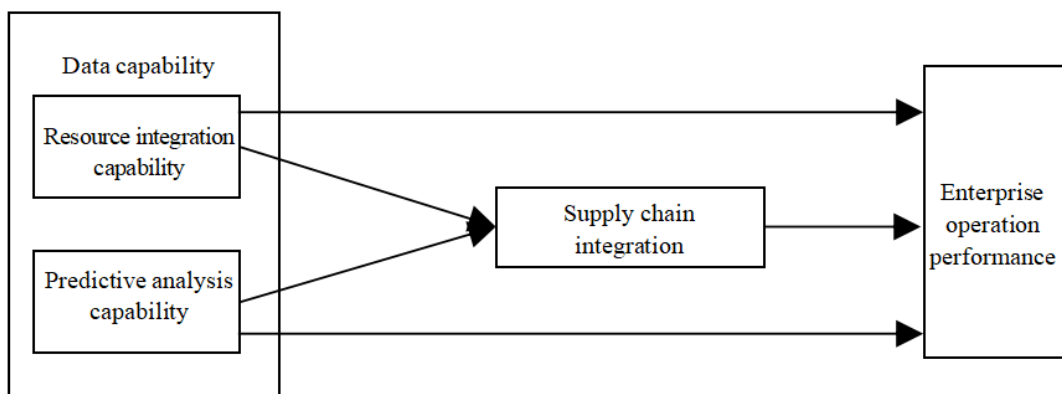


Figure 2. Influence path of supply chain innovation on the operational performance of manufacturing enterprises

Network collaborative manufacturing platform, industry chain, industry agglomeration area, and so on are the main contents of the manufacturing network collaborative manufacturing development model. According to the different degrees of geographical aggregation of enterprises, the network collaborative manufacturing model defines the scope of operation as within an industrial agglomeration region or between several industrial agglomeration regions. The manufacturing enterprises and suppliers transmit the data they can provide, such as product introductions, prices, after-sales guarantee terms, etc., to the network collaborative

manufacturing platform. Additionally, the users also post their demands to the network collaborative manufacturing platform. The platform analyzes and processes service data, and user demands employing data-driven methods and sends them to all industrial chain participants, thus effectively integrating upstream production materials and downstream markets. Furthermore, it makes use of the control, processing, and optimization of the information chain, the logistics chain and the capital chain to complete the call and reasonable distribution of resources, and forms a complete industrial chain structure.

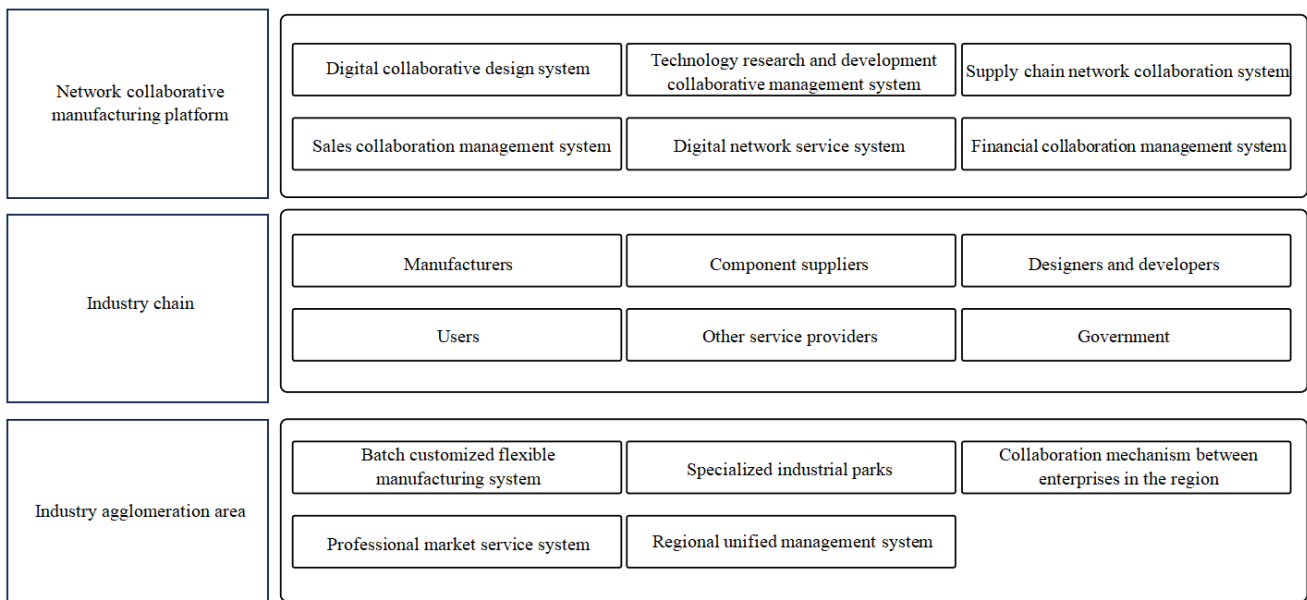


Figure 3. Manufacturing enterprise information technology collaborative management

The data capability improves the degree of supply chain integration between enterprises by facilitating information sharing, implementing joint decision-making, and conducting cooperative alliances between supply chain enterprises. Under the fierce supply chain competition, the core competitiveness of enterprises depends on whether they can grasp relevant information in a timely manner. Moreover, the continuous improvement of data capability can help supply chain integration, enabling enterprises to obtain resources favorable to themselves in the complex big data network of the supply chain and helping them to effectively allocate and reorganize messy resources. Additionally, this kind of supply chain integration will further affect the operation activities of the enterprises and promote the enhancement of the enterprises' operational performance. From the theory of information asymmetry, enterprises integrate data and information in the supply chain through big data capabilities. As the degree of supply chain integration continues to improve, the data and information can be more comprehensively presented to the enterprise, and the supply chain members gradually establish a good information communication channel between them. Furthermore, through the in-depth exploration and utilization of their existing knowledge, they enhance the big data capabilities, thus providing timely feedback to the enterprise. The enterprise will continue to make changes in the operational results, which in turn will affect the enterprise's operational performance.

4. Manufacturing Supply Chain Innovation Strategy Under the Perspective of Collaborative Management

4.1. Development of a supply chain network collaboration platform for manufacturing enterprises

Supply chain collaboration management is a modern supply chain management concept. The supply chain collaboration management on the node enterprises and the cooperative relationship between the node enterprises have

different requirements from the ordinary supply chain management. It is not only conducive to achieving a good situation of collaborative operation, mutual benefit and coexistence, and a win-win situation among the enterprises in the system but also conducive to improving the competitiveness of the whole supply chain and the enterprise's performance.

Given the production characteristics of the manufacturing industry with diverse varieties and changing demands, a network collaborative manufacturing platform is constructed for the pre-design, technology development, component supply, intelligent service, financial management, and other links in the product's whole life cycle. Moreover, it integrates a digital collaborative design system, technology research and development collaborative management system, supply chain network collaborative system, sales collaborative management system, digital network service system, and financial collaborative management system.

The design phase primarily focuses on the increasing demand for personalized customization by users, conducts demand analysis and effective design, and then builds a mechanism for releasing personalized customization demand. It can purposefully improve the accuracy and timeliness of the analysis of user demands by the participating design subjects.

For the problems of imperfect supply chain standard system, insufficient information and resource sharing, and low level of supply chain management of components in current manufacturing enterprises, a supply chain network cooperative system including order tracking, monitoring of suppliers' production capacity, early warning of supply status, information sharing, accurate distribution of materials, and real-time visualization, etc., has been designed to achieve the intelligent management and control of supply chain system oriented to the business process of suppliers.

For the problems of untimely updating of data and lack of communication with vendors in the sales process, a sales collaboration management system has been set up. The main functions are intelligent analysis and sharing of sales data; remote collaborative management of vendors; real-time and effective updating of inventory data; formulation of product inventory management methods, and establishment of an intelligent update system for inventory details.

government, service providers, and the network collaborative platform, it achieves information sharing and forms a close strategic cooperative relationship. Moreover, based on the financial chain, the government, manufacturers, designers, component suppliers, users, and service providers utilize the financial collaborative management system of the network collaborative manufacturing platform to handle purchase tax subsidy applications, account management, financial settlements, and so on. The production manufacturers, component suppliers, and users are closely connected through the logistics chain and the order tracking, supply status early warning, precise material distribution, and other modules of the network collaborative manufacturing platform to ensure that all parties have timely and accurate logistical information to ensure the fast and precise supply of goods.

The designer connects with the manufacturer, the user releases the personalized customization demand to the network collaborative manufacturing platform, the designer analyzes and processes the user's demand through the personalized customization demand release system and the module automatic identification technology, and then forms and sends out the design scheme. Then, the manufacturer conducts research, development, and manufacturing according to the upstream design scheme, releases the demand information of components to the supply chain network collaborative system through the network collaborative manufacturing platform, selects and signs the contract with the component suppliers, and carries out the logistic tracking and production capacity monitoring through the network collaborative manufacturing platform. The service provider provides after-sales service for the products through the network collaborative manufacturing platform, and it can also provide feedback on technical problems to the manufacturer. The government effectively monitors the data and information of all parties in real-time through the network collaborative manufacturing platform and popularizes the subsidy policy in real-time.

By optimizing the information chain, logistics chain, and capital chain of the manufacturing chain, the following objectives can be achieved:

Firstly, cost reductions for manufacturers, achieving quantity discounts and stable prices, improving product quality while reducing inventory levels, improving time management, shortening delivery time, and increasing reliability.

Secondly, to ensure that suppliers have stable market demand, a better understanding of user demands, improved quality of operations, improved quality of component production, reduced production costs, and improved responsiveness to changes in buyer delivery schedules.

Thirdly, reduce duplication of labor for upstream and

downstream of the supply chain, and simplify the process of redundant steps, thus making the supply chain process low-cost and efficient.

5. Conclusion

In the digital times and digital economy, the factors of production circulate faster, the production model tends to be modular and flexible, and innovation no longer has just one sector or one area. This means that management complexity is extremely increased, and more management variables and contexts need to be considered. For enterprises and managers, the collaborative management framework can be followed to construct the supply chain system. Moreover, manufacturing enterprises must pay attention to the construction of data capability and analyze the data capability to obtain diversified internal and external resources, increasing the possibility of improving the enterprise's operational performance. Additionally, when enterprises cultivate data capability, they also need to strengthen supply chain innovation, give full play to the advantages of internal and external cooperation in the supply chain, improve the capability of acquiring, maintaining, and utilizing supply chain resources, and enhance their own capability, which is crucial to the improvement of the enterprise's operational performance.

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