

# Research on Supply Chain Information Collaboration and Performance based on Inter-organizational Information System

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**Abstract:** In China's market environment, more and more enterprises use inter-organizational information system to make information flow across organizational boundaries. It can strengthen the cooperation between organizations and win strategic competitive advantages for enterprises. Supply chain management is one of the most important parts. Therefore, this article starts from the main functional direction of big data technology, analyzes the impact of big data system on the information aggregation ability and information extraction level of supply chain enterprises, adopts Likert five-point scale to measure supply chain performance, and proves through empirical evidence. It is verified that the ability of information aggregation and the level of information extraction have a significant positive impact on the performance of the supply chain. Finally, the study will present a comprehensive framework to deal with the supply chain performance of Chinese enterprises and a modest addition to the supply chain performance literature concerning strategies for elevating supply chain performance in the Chinese enterprises. It aims to provide inspiration for Chinese managers and organizations to cope with the escalating challenges.

## 1 INTRODUCTION

In the era of economic globalization, the competition among enterprises is unprecedentedly fierce, the demand for technology renewal and information resource control is unprecedentedly high, and further spread to the supply chain level. Using big data technology to improve the core competitiveness of the supply chain has become an inevitable choice for relevant enterprises (Singh, 2016, Teng, 2016). In the era of network economy, information has become one of the most important resources in supply chain management. It can be said that whether supply chain partners can effectively "share information" has become the key to the success or failure of supply chain management (Asamoah, 2020, Agyei-Owusu, 2020, Andoh-Baidoo, 2020). With the gradual deepening of organizational performance and quality management research, controlling information resources to coordinate quality management systems among different enterprises has reached a certain consensus in academic research and practical practice (Yang, 2020, Chen, 2020, Hao, 2020). However, in what way does big data system affect supply chain quality management and ultimately improve

organizational performance, it has not formed a generally recognized theoretical system (Tran, 2016, Childerhouse, 2016, Deakins, 2016). Information sharing among supply chain partners can effectively reduce the bullwhip effect, reduce information distortion and information risk in supply chain management, and effectively improve the operation performance of supply chain (Partanen, 2020, Kohtamki, 2020, Patel, 2020). At present, the problem of information sharing among supply chain partners has become the focus of theoretical research, and a large number of research results have been obtained (Kim, 2016, Han, 2016, Yi, 2016). However, these research results mainly focus on the value of information sharing among supply chain partners, and there are few research results on the pre factors of information sharing among supply chain partners (Wu, 2021, Ma, 2021, Li, 2021).

Profound changes have taken place in the traditional market, and the scope of management has been expanded to all relevant resources inside and outside the enterprise (Basak, 2016, Guha, 2016). In this new competitive environment, if enterprises want to remain invincible, they must re-examine their business models, strengthen their internal process

management and contact with partners in the supply chain to meet the changing needs of customers, and quickly respond to the opportunities brought by their competitors' new business models and new technologies (Long, 2017). Information sharing among supply chain partners is inseparable from the support and assistance of IT technology and information system. The organic integration and collaboration of information system among supply chain partners will be a solid foundation for sharing information (Rameshwar, 2018, Angappa, 2018, Childe, 2018). Therefore, information system collaboration among supply chain partners is likely to be a very important factor affecting information sharing, but further in-depth empirical research is needed (Zhang, 2018, Cao, 2018). In order to make up for the deficiency of current theoretical research, this study will use empirical research methods to explore the impact of supplier and manufacturer information system collaboration and information sharing on enterprise operation performance, and it is expected that this study can provide practical theoretical basis and guidance for Chinese enterprise supply chain management (Zhang, 2018, Cao, 2018).

## 2 DEFINITION OF RELATED CONCEPTS

### 2.1 Supply Chain Management

In order to have a deeper understanding of supply chain and supply chain management, the definitions of "supply chain" and "supply chain management" by domestic and foreign scholars will be described and combed below. Supply chain is a process of controlling from suppliers to users through value-added process and distribution channels. It starts at the origin of supply and ends at the end of consumption. Supply chain is a network cooperation between organizations, including products and services from upstream to downstream. Supply chain is a network composed of a series of units. The network successfully transforms raw materials into intermediate work in progress, and finally into final products and delivers them to customers and final consumers. The process from raw materials and parts procurement, transportation, processing, manufacturing, distribution to final delivery to customers is regarded as a chain, which is the supply chain. The business process of the supply chain can be divided into four aspects: work process, physical

process, information process and capital process, as shown in Figure 1:

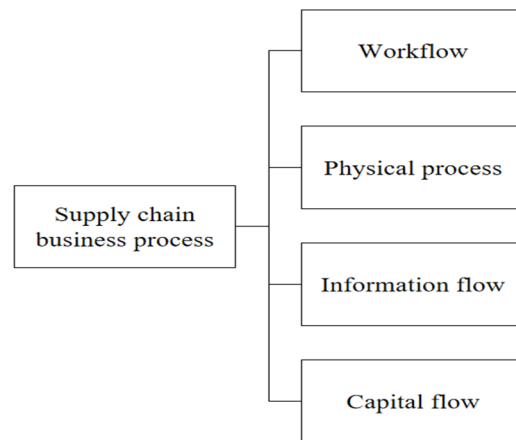


Figure 1: Supply chain business process.

Workflow, that is, transaction and management, is the use of information to make decisions. The workflow starts from the needs of consumers. The initial work includes demand analysis, product development and design, and the formulation of production plan; Then there is the occurrence of business and transactions, including the conclusion of contracts and commitment to transactions between enterprises, and making transaction decisions is the most important work of all entrepreneurs; The last is the implementation, including the whole process from organizing production, handling import and export documents to implementing sales. Physical process is the delivery and transfer of physical goods, and it is a necessary process to perform transactions. The physical process includes the whole transportation process, warehouse management and packaging distribution. Compared with logistics, capital flow is a process in which enterprises collect customers' payment and pay off suppliers' payment after selling products. Information is the basis of action in all links of the supply chain. The information process includes collecting, processing and analyzing data and providing useful information to assist each member of the supply chain to make appropriate business decisions and take corresponding actions. Supply chain management is to optimize the supply chain and complete all processes from procurement to meeting the final customers at the least cost. The above workflow, physical process, capital process and information process are required to operate efficiently.

## 2.2 Supply Chain Integration

Supply chain integration is a very important research direction in the field of supply chain management in recent years. Supply chain integration integrates the management of various relationships, activities, operations, processes and locations of different members in the supply chain. However, there is no unified standard for the definition of supply chain integration at home and abroad. Most scholars define it based on their research perspectives and needs. Therefore, the following will sort out the concepts and dimensions of supply chain integration, and define "supply chain integration" on this basis, so as to lay the foundation for the development of various studies in this paper. Supply chain integration is a kind of cooperation management between supply chain partners in order to provide customers with higher value and improve competitive advantage. Supply chain integration refers to the collaboration and cooperation within and among node enterprises in the process of supply chain management, including: the behavior integration of node enterprises, the process integration of the whole chain network, information integration, sharing risks and rewards, collaboration and cooperation and relationship integration. On the one hand, the main motivation of most enterprises participating in supply chain integration is to integrate internal and external processes through strategic cooperation with supply chain partners, so as to efficiently manage product flow, service flow, information flow and capital flow, and finally obtain excellent performance. Therefore, how to understand "performance" is particularly important. On the other hand, because this paper mainly discusses the relationship between supply chain integration and performance, it is necessary to clearly define the concept of "performance". As shown in Figure 2, the factors affecting operation performance are:

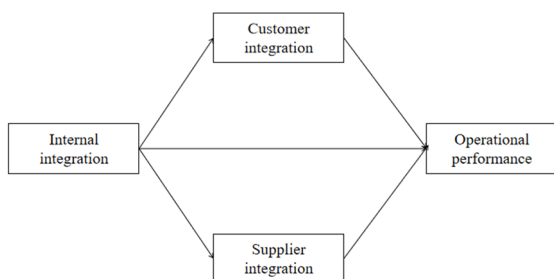


Figure 2: Factors affecting operational performance.

Performance is a concept of "performance" involved in this paper, including enterprise

performance and supply chain performance. Among them, enterprise performance is analyzed from two aspects: enterprise operation performance and enterprise financial performance. Through the analysis of the literature on the relationship between supply chain integration and enterprise performance, it is found that generally speaking, enterprise performance includes operation performance, innovation performance, customer service performance, market performance, financial performance, etc. these studies will define and measure different performance according to actual needs, and there is no unified definition. The financial performance of enterprises mainly refers to the performance of enterprises in terms of profitability, operation ability and solvency. Generally, the indicators that may be used include return on assets, earnings per share, return on sales, return on investment and so on. There are many different views on the definition of supply chain performance. Generally speaking, it can be defined from the aspects of customer orientation, internal operation, future development, financial value and so on. Supply chain performance is defined and measured from the aspects of supply chain flexibility, delivery, inventory, efficiency and new product introduction speed.

## 3 THEORETICAL BASIS OF SUPPLY CHAIN INTEGRATION RESEARCH

### 3.1 Transaction Cost Theory

The use of resources often can not rely on market guidance. Due to the high transaction cost in the market, enterprises can reduce the transaction cost by allocating resources instead of the market. Transaction cost theory mainly discusses how to minimize production costs and transaction costs while constructing their own boundaries, including various necessary behaviors. Transaction cost determines whether a transaction is carried out in the enterprise or in the market. The factors affecting the transaction cost are divided into six categories, and these six categories of influencing factors do not exist independently, but a complex relationship and will affect each other, and finally increase the transaction cost. Bounded rationality, the original rational behavior of human beings trying to maximize their interests, will limit their rational behavior because of the limitations in spirit, physiology and language.

Therefore, the behavior in the transaction process is not the most rational result, and the irrational behavior of both parties will increase the difficulty of transaction; Opportunistic behavior refers to the lack of frankness or honesty in transactions, including seeking self-interest by deception; Uncertainty is a situation in which it is impossible to predict partner behavior or future changes in the external environment; For a few transactions, because some transaction processes are too specialized, or because heterogeneous information and resources cannot flow, the trading objects are reduced or the market is controlled by a few people. If this happens in the transaction, it is easy to produce opportunistic behavior; Information asymmetry is due to uncertainty and opportunistic behavior; Atmosphere: under the condition of harmonious atmosphere, the negotiation process or contract signing between the trading parties is very smooth. On the contrary, if there is speculation and distrust between the trading parties in the trading process, it becomes more difficult for both parties to sign and trade, and increases the transaction cost. As shown in Figure 3, it is a longitudinal study of performance growth:

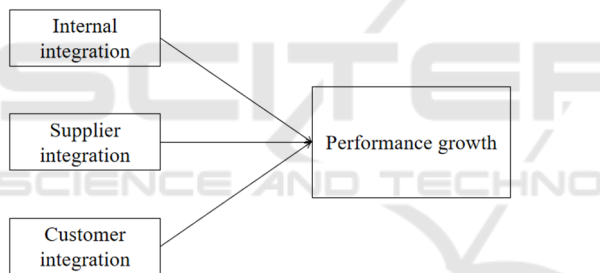


Figure 3: Longitudinal research on performance growth.

Due to the change of market environment, information asymmetry and human bounded rationality, people can not fully predict the future situation in advance. In addition, the uncertainty will also affect the investment of special assets, and then affect the specific degree of investment protection. Transaction uncertainty increases the market risk and makes the signing of transaction contracts more complex. With the increase of supervision cost and bargaining cost, the transaction cost increases. With the increase of transaction frequency, the collection cost of transaction information and the signing cost of transaction process will increase significantly. However, at the same time, multiple transactions or cooperation will also make each other understand each other and increase the degree of mutual trust, which can reduce opportunistic behavior, reduce the risk of cooperation and improve the efficiency of

cooperation. In addition, the increase of transaction frequency makes the enterprise internalize the economic activities of the transaction to save the transaction cost of the enterprise.

### 3.2 Methods of Researching Content

Based on the realistic background and research status, aiming at the shortcomings of the current research, this study focuses on "whether and how supply chain integration affects performance". Based on cross-sectional data, this paper mainly discusses the impact mechanism of internal integration, customer integration and supplier integration of supply chain on enterprise operation performance, and then analyzes the impact of situational variables such as enterprise scale, industry attribute and country on the relationship between the above variables; Based on the longitudinal data at two time points, this paper mainly discusses the impact mechanism of internal integration change, customer integration change and supplier integration change of supply chain on enterprise operation performance change and supply chain performance change. On this basis, this paper discusses the mode of supply chain integration and its relationship with enterprise operation performance and supply chain performance. The research methods used in this study mainly include the following four methods: literature discussion and theoretical analysis method, questionnaire survey method, second-hand data method and data statistical analysis method, as shown in Figure 4:

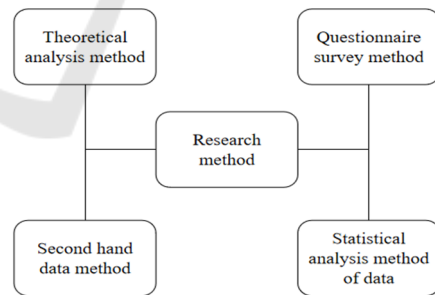


Figure 4: Research methods of supply chain information.

The study, sorting and analysis of relevant literature is the basic work of academic research, which lays a solid foundation for learning from relevant theories and understanding the latest research trends. In order to explore the impact mechanism of supply chain integration on operational performance, supply chain performance and financial performance, analyze the key influencing factors of supply chain integration and how different forms of

supply chain integration affect performance, this study will collect a large number of relevant literature at home and abroad, analyze and sort out relevant literature from the aspects of theoretical basis and research status. It is concluded and compared to clarify the concept and its relationship, so as to lay the foundation for the research hypothesis and conceptual model; Questionnaire survey is one of the main research methods of this study. The number and scope of enterprises and the variables involved in the questionnaire mainly include supply chain integration, operation performance and supply chain performance; The second-hand data method is organized, implemented and submitted on time according to the contents of the statement system of industrial enterprises formulated by the National Bureau of statistics. Industrial statistical indicators include main technical and economic indicators such as industrial added value, total industrial output value and industrial sales output value, as well as main financial cost indicators, employees and total wages; Data statistics and analysis methods. In order to process the data and verify the research hypothesis, the data analysis methods used in this study mainly include: descriptive statistical analysis, analysis of variance, correlation analysis, exploratory factor analysis, confirmatory factor analysis, structural equation model analysis and hierarchical linear model analysis.

## 4 CONCLUSIONS

Using structural equation model and difference analysis method, supply chain information discusses the relationship between information system collaboration, information sharing and operation performance between manufacturers and suppliers, and obtains some meaningful conclusions: firstly, we believe that information system collaboration among supply chain partners is a unique, scarce and non imitable competitive resource of enterprises, It can bring sustainable competitive advantage to enterprises; Secondly, our empirical results show that information system collaboration among supply chain partners plays a very important role in improving the content and quality of information sharing; Thirdly, our empirical results also find that the direct effect of information system collaboration among supply chain partners on enterprise operation performance is not significant; Fourth, our empirical results also show that the information sharing content and information sharing quality among supply chain partners have a significant positive impact on all

dimensions of enterprise operation performance, which means that the information system collaboration among supply chain partners has a significant indirect effect on enterprise operation performance. Senior management should not only pay attention to the construction of information infrastructure of investment enterprises, but also pay attention to the seamless connection with the information systems of upstream and downstream enterprises of supply chain partners, so as to improve the coordination level of information systems among supply chain partners, so as to cultivate them into the company's core resources, which will bring sustainable competitive advantages and benefits to the company. Only when the mutual trust relationship reaches a certain level, the information systems of both sides can realize seamless connection.

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