

Coordination Mechanisms in the Supply Chain Based E-business

Li Sui-cheng^{1,2}, Cui Xian-xia¹, Liang Gong-qian²

¹ Management School, Xi'an University of Technology, Xi'an 710048, China

² Management School, Northwestern Polytechnical University, Xi'an 710072, China
lisc@xaut.edu.cn, cuixianxia@163.com

ABSTRACT

Supply chain management has been influenced greatly by e-business, so does coordination which is regarded as the core of supply chain management. The characteristics of supply chain management based on e-business are analyzed firstly, which describe that information transmission has been accelerated and the relation between enterprises has become not only competitive but also cooperative under e-business environment. Differences of coordination mechanism between tradition environment and e-business environment are compared secondly. Finally, according to market relation and competitive-cooperative relation between enterprises, the suitable coordination mechanisms based on e-business are put forward. The paper presents a framework to assist managers in adopting the suitable coordination mechanisms under different business environment.

Keywords: Supply chain management, E-business, Coordination mechanism, Cooperative relation

1. INTRODUCTION

Supply chain management (SCM) has gained significance as one of the 21st century manufacturing paradigms for improving organizational competitiveness. Emphasizing strategic collaboration, information sharing, responding to market rapidly etc, the key of supply chain management is to manage and coordinate the cooperation between enterprises of supply chain. However, because the application of the network and information technology lags behind the relative advanced management mode, the traditional supply chain based on paper, fax, is difficult to share information simultaneously between enterprises. Though some manufacturing companies have adopted the systems, such as MRP II, ERP, CRM, DSS, etc, the systems can't fully support and reflect the strategic advantage and systematic characteristic of supply chain management. These systems are often limited in single enterprise and the Online Electronic Linkage between partners and the interface between the enterprise and customer are weak, which lead to the lone island of information of supply chain.

E-business is a kind of social form of business operation using modern computer information technology, especially network technology. The basic purpose of e-business is to realize the maximization of the social wealth through improving productivity, reducing the operating costs, optimizing resource distribution. The rise of e-business is a revolutionary of the business operation mode caused by the rapid development of information technology, which leads to the great change in existence foundation, operation way, management mechanism of traditional economic activity, then the traditional market ideas, and then the theories and methods of supply chain management. As a result, e-supply chain management appears being the combination of e-business and supply chain

management.

As one of new management modes, supply chain management integrates and coordinates resources of all nodal enterprises, so coordination is the core of supply chain management. Under e-business environment, the communication in organization becomes more convenient. And the institutional structure is a hierarchical network system, which make the range of management bigger and the amount of information that the members need to accept and deal with older. In addition, carrying on customer relation management and establishing learning organization make it difficult to obtain, share and integrate the information in the supply chain. Because the uncertainty of market is increasing under e-business environment and the relation between partners becomes complicated, partners will often intend to conceal the information or the knowledge resources in consideration of one's own interests. At the same time, with the application of e-business, managers can set up various coordination mechanisms through network. Using the appropriate coordination mechanisms offers the potential to help managers improve business performance, increase revenues, reduce costs and reach new markets. However, for these to happen, management practices must be adapted to the new environment. The Internet facilitates the implementation of a variety of coordination mechanisms, such as auctions, electronic agents, etc. The challenge that the managers face is to choose the mechanism that best fits each situation. So grasping the coordination mechanisms of supply chain based on e-business is very important to go on the deeper research of supply chain management and has great directive significance to apply the thoughts of supply chain management to our country.

The purpose of this paper is to identify which coordination mechanism is best fit to the practical business environment. At first the characteristics of

supply chain under e-business environment are analyzed. The differences of coordination mechanisms between tradition environment and e-business environment are compared from running environment, feedback mechanism etc. Then the suitable coordination mechanisms under e-business environment are put forward and compared. The text is summarized finally.

2 SUPPLY CHAIN MANAGEMENT BASED ON E-BUSINESS

With the improvement of information technology and the aggravation of economic globalization, the development of e-business is very fast. As the statistics of relevant materials showing, the global turnover of e-business reaches 15,300 million Yuan in 1998, rises to 26,500 million Yuan in 1999, increases about 73% per year on average. E-business is concerned by all walks of life, and management theories and operation modes have changed deeply.

2.1 Characteristics of Supply Chain Management Based on E-business

Supply chain management has been influenced by e-business. Manufacturers can sell products to consumers directly not having dealer or the retailer through e-business, which eliminate some unnecessary links of supply chain. Meanwhile, the information flow and fund flow between enterprises are more frequent. The relation between enterprises has changed. Therefore, under e-business environment, supply chain management has some new characteristics.

1) The complication of relation between enterprises

Traditional supply chain regards production as the centre. Because of the existence of the seller's market, the seller can control the buyer through price and quantity of supply, and the relation between buyer and seller is a kind of short-term contract, that is a kind of competitive relation. Because of the appearance of advanced management thought, such as MRP, JIT, TQM, etc., the relation between enterprises changes into the logistic relation progressively. The main characteristic of logistic stage is the integration of enterprises based on material. The cooperative relation of enterprises based on logistics is only a basic cooperation.

With the appearance of e-business, the cooperation between enterprises of supply chain has been strengthened. Not only the material flow, but also the information flow is transferred between enterprises. Strategic cooperative relation appears. The relation between enterprises of supply chain is becoming more complicated which is not only competitive but also cooperative.

2) Enhancement of information sharing

The purpose of information integration is to realize information sharing of supply chain enterprises, reduce the influences of uncertain factors. The information transmission of traditional supply chain is a chain which can easily lead to "bull whip effect". After e-business appears, supply chain management is set up a centre of information management based on Internet which is a mode of network information integration. It can store all kinds of data, and deal with information in time. It is helpful to realize the cooperation between enterprises and improve the integration of information in the supply chain.

3) Realization of synchronized operation

The synchronized operation between enterprises of supply chain can reduce the delay of demand information, improve the working efficiency. Because of the distorting of information transmission and the relation of competition between enterprises, the traditional supply chain is very difficult to take operation in step. Under the environment of e-business, the synchronization can be realized by Internet. Through Internet, enterprises can forecast, make and implement the relevant plan together. Meanwhile, buyers and sellers can share the result of forecasting, exchange the views and coordinate the difference of both sides in time. Therefore, supply chain management can realize the synchronization entirely on internet.

4) The transformation of management focus

Under the traditional mode of management, the focus of supply chain management is how to create value using the advantage of production technology and management. In e-business era, the focus of supply chain management is how to assure "power origin" status of consumers, how to obtain knowledge through an analysis of uncertain demand, and how to create value by sharing knowledge with the whole supply chain. So the supply chain enterprises should collect and share of demand information, and change them into knowledge which can improve the efficiency of supply chain by the knowledge converter.

5) pull-operational mode of supply chain

The operational mode of traditional supply chain is a typical kind of push management. After having produced goods, manufacturers send them to retailer or customer by utilizing logistics. In this course, the trade flow and material flow are push management. The logistics doesn't create value by itself but only plays the function of supporting while the whole goods move. However, supply chain based on e-business is different. Because the activities of commodity production, distribution, storage and delivery are all operated according to the customer's order, all the activities including trade flow, material flow and fund flow are all connected with market. Logistics has not only offered a

strong guarantee for trade flow, but also created value at the same time because it is the component of the customer service.

6) The appearance of virtual market

In e-business era, the living space of enterprises has changed to not only physical market but also virtual market. The virtual market is based on information, and controlled by information. The appearance of virtual market has changed the situation that consumers must use or enjoy products / serve through the physical market, and weakened the restriction that producers must gain and produce resources through the physical market. Physical value chain which enterprises depend on in the supply chain becomes virtual. Enterprises can seek new points of creatable value by the information technology such as integration, organization, choice and synthesizing etc.

2.2 Comparison of Coordination Mechanisms between Traditional Supply Chain and E-business Supply Chain

Coordination is the administrative behavior based on the communication of information. With the appearance of e-business, the communication of supply chain enterprises becomes more convenient. A lot of new information sharing platforms have been used. Many new coordination mechanisms are presented, such as on-line auction, electronic agent and VMI etc. At the same time, because of the improvement of information technology and the expansion of economic globalization, the relation between supply chain enterprises has not only competitive but also cooperative. So there are differences of coordination mechanisms between traditional supply chain and e-business supply chain.

1) Running environment

Traditional coordination mechanisms are mainly considered the internal coordination of single enterprise which cope with uncertain market under fixed environment. Therefore the coordination mechanisms survive in a "steady" environment. Under the environment of e-business, information sharing between enterprises of supply chain is more frequent. In order to reply the changeable market quickly, rational coordination mechanisms must be set up between enterprises of supply chain. However, the change of decision for any enterprise will cause the difference of decision for other enterprises because of interdependence of supply chain enterprise. The coordination mechanisms must be fit for dynamic environment. The coordination mechanisms should be made by considering the uncertain factors of environment of supply chain management, so that the supply chain can deal with the market quickly and

effectively.

2) Decision mode

There are two kinds of decision modes for the coordination mechanisms of traditional supply chain: centralized decision and distributed decision. Centralized decision supposes that the decision center can get information of all relevant enterprises or departments, and make relevant decision based on all information. Distributed decision is another kind of extreme form of decision mode, and the decisions are made by each enterprise or department according to their own information. Under the environment of e-business, depending on information technology, information can be transmitted fast among enterprises, the operation of synchronization among enterprises will be realized, and the purpose of responding to market and meeting customer's demand will be achieved. But the real supply chain is often a competitive-cooperative system formed by different enterprises whose purpose is to maximize their own interests, so the key enterprise can not obtain all information needed. While setting up the coordination mechanisms, enterprises should consider both their own existing information and the information of partners that can be received, which can expand the whole optimization space of supply chain.

3) Feedback mechanism

The implementation of any system must set up a feedback mechanism of information. The implementing quality of coordination mechanism is strongly connected with the feedback mechanism. The traditional feedback mechanism is a type of chain. The feedback of information is transmitted from one department to another, which forms a parallel mode of information transmission with organizational structure. Supply chain based on e-business has a feedback mechanism having the characteristics of network. The information of enterprises is transmitted not according to the organizational structure, but the different enterprises in the supply chain. Because the organizational forms of enterprises in the supply chain are different, the forms of information flow are different.

4) Transparent degree

The enterprise of traditional supply chain which regards their own interest as the center neglects the information and interests of partners. The coordination method adopted is mainly to optimize one's own interests. Under the environment of e-business, there is very strong cooperative relation between enterprises. The information of all enterprises of supply should be considered while making decisions. The coordination mechanisms of enterprises should have heavier transparency in order to gain the synchronal operation in the supply chain.

3 COORDINATION MECHANISMS BASED ON E-BUSINESS

Under the environment of e-business, information sharing between enterprises of supply chain management is increasing, and relation between enterprises is different. For example, ShiHua Ma divides the partner's type into four kinds from both increment function and competitiveness: strategic cooperative partner, competitive / technical cooperative partner, powerful cooperative partner, and ordinary cooperative partner. Kim Langfield-Smith divides it into three kinds: non-cooperation, short-term cooperation, close cooperation and cooperative network relation. So in order to stimulate partners effectively, different coordination mechanisms should be applied to different partners. The paper presents the suitable coordination mechanisms under e-business environment according to market relation and competitive-cooperative relation.

3.1 Market Coordination Mechanisms

Market coordination is used to conduct a business transaction, to purchase something at a given price. Frequently, market coordination is used to foster price competition among potential suppliers. Therefore, market transactions are often one-time transactions because a different supplier can be selected for each transaction. The information that is shared using market coordination is generally limited to the conditions of the transaction, delivery information and payment, in addition to bidding processes. Usually, market coordination will not provide a sustainable competitive advantage to a firm. Nonetheless, they tend to be simple to use and frequently offer the opportunity to purchase some items at a lower price, making them popular. We identify two market coordinative mechanisms: on-line coordination and Electronic agents.

On-line auction is a market mechanism in which the buyers and seller agree on the item to be auctioned, and on payment and delivery conditions. Under the environment of e-business, auction has new characteristics. Firstly, no relation-specific assets between buyer and seller are needed in an on-line auction on the internet. Secondly, because auctions are one-time transactions, the transaction risk is low and the operational performance risk for auctions can be high. Finally, since the preparation for and the participation in an auction is time consuming, the frequency of transaction needs to be low. Higher frequency might make other coordination mechanisms preferable.

Electronic agents that focus on studying the coordination mechanism between the entities are the core in the field of the distributed artificial intelligence in recent years. They connect commercial goal with customer's interests to reduce the transaction costs between buyers and sellers automatically. Electronic agents are part of the IT infrastructure since they are used for doing business with all possible customs or

suppliers. There are no relation-specific assets. Further, automated transactions are one-time transactions, which makes the transaction risk low. For the same reason, operational performance risk is considered medium to high.

3.2 Competitive-cooperative Coordination Mechanisms

With the violence of market competition, the relation between enterprises changes to competition and competition-cooperation. Because the foundation of coordination is cooperation, market mechanism can be adopted under competitive relation, while competitive-cooperative coordination should be applied under competitive-cooperative relation. The contents of competitive-cooperative coordination include not only price, but also time, quantity, planning, stock, etc. coordination. Implementing competitive-cooperative coordination requires medium asset specificity, which is lower than implementing an EDI link, but it is higher than implementing other market mechanisms. Transaction risk due to closeness of the relation is high given that competitive-cooperative coordination is generally implemented with key members of the supply chain. Operational performance risk is low since management may implement coordination to actively manage the relation and, ultimately, to reduce risk of operational failure. Two competitive-cooperative coordinative mechanisms are identified: stock coordination and planning coordination.

Stock coordination can improve the systematization and integration of supply chain, and strengthen the agility and response of enterprise through controlling the inventory. The emphasis of stock coordination is to reduce "bull whip effect" caused by the separating stock of enterprises and improve synchronization of supply chain. Stock coordination that reflects new-type cooperative relation of supply chain is a stock management of risk sharing

Planning coordination is a new-mode of supply chain coordination mechanism and is considered requiring high cooperative degree between enterprises. It emphasizes the information sharing that should carry on from drawing up to implementation of the plan between enterprises, which increase the whole flexibility of supply chain.

4 CONCLUSIONS

With the development of e-business, information transmission between enterprises of supply chain becomes faster and faster. At the same time, the relation between enterprises changes into not only competition but also cooperation. So supply chain management changes greatly, and as the core of supply chain management, coordination has heavy difference too. Firstly, the influences of supply chain management that

are brought into by e-business are analyzed. Secondly, the differences of coordination mechanisms between traditional environment and e-business environment are compared. Finally, the suitable coordination mechanisms under e-business environment are put forward. There are positive impetuses for the administrator to identify the suitable coordination under all kinds of business environment. Applying different coordination mechanisms to different partners can greatly improve the performance of supply chain.

ACKNOWLEDGEMENT

This paper is supported by the Natural Science Foundation of educational department of Shaanxi province.

REFERENCES

- [1] Sebastian J. Garcia-Dastugue, Douglas M. Lambert, "Internet-enabled coordination in the supply chain", *Industrial Marketing Management*, Vol. 32, No. 2, pp251-263, 2003.
- [2] Xu Bo-yi, Tang Yue, Feng Ning, "A Case Study on E-business Supply Chain Management", *proceeding of the National Youthful Council on Management Science and System Science*, Vol. 1, pp452-458, Dalian, 2001.
- [3] Lan Bo-xiong, Zheng Xiao-na, Xu Xin, "Supply chain management in E-business era", *Chinese Journal of Management Science*, Vol. 8, No. 3, pp1-7, 2000.
- [4] Zhang Wei, Huang Xiao-yuan, "Impact of E-business on supply chain integration", *Journal of Northeastern University(Social science)*, Vol. 5, No. 4, 2003.
- [5] Richard Lancionia, Hope Jensen Schaub, Michael F. Smithc, "Internet impacts on supply chain management", *Industrial Marketing Management*, Vol. 32, No. 2, pp173-175, 2003.
- [6] Zillur Rahman, "Internet-based supply chain management: using the internet to revolutionize your business", *Information Management*, Vol. 23, No. 2, 2003.
- [7] Christoph Schneeweiss, Kirstin Zimmer, "Hierarchical coordination mechanisms within the supply chain", *European Journal of Operational Research*, Vol. 153, No. 4, pp687-703, 2004.
- [8] Kirstin Zimmer, "Supply chain coordination with uncertain just-in-time delivery", *INT.J. Production Economics*, Vol. 77, No. 1, pp1-15, 2002