Multi-agent framework for third party logistics in E-commerce☆

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Abstract

In an e-commerce environment, the third party logistics (3PL) takes charge of the logistics design, delivery, storage and transportation in a supply chain with its professional and complete value-added services. Beginning with an analysis of the relationships between the 3PL and supply chain members, the authors suggest that only when the 3PL reengineers its logistics business process to accommodate the customer could it maximize the value of the customer. Finally, five intelligent agents, order management agent, logistics process reengineering agent, resource scheduling agent, dynamic union management agent and simulating and evaluating agent are designed to form an e-commerce based 3PL system which, with the collaboration of the five agents, could construct a virtual private logistics teamwork suitable for a certain customer's need and furthermore, realize the win–win between the customer and the logistics service vendor.
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1. Introduction

The tendency of the global economic development makes the competition of the supply chains be the main and essential one between two individual enterprises. Only when its whole supply chain keeps high competitive could an enterprise survive for a long time. The rapid development of e-commerce makes it possible to integrate and improve the competitive advantages of the whole supply chain because the openness, globalization, low-cost and high-efficiency of e-commerce extend the internal information network of an enterprise and enable the business to business (B2B) e-business activities among several enterprises. The involved enterprises are connected to be a larger and more interactive supply chain network system in which exist four flows, i.e. flow of goods, flow of information, flow of financing and flow of trading. Integration of four flows is one of the characteristics of e-commerce supply chain even though they are running in different velocities. For the velocity of goods flow is far slower than that of other three ones, the goods flow has been the bottleneck of the supply chain. To increase the flow rate of goods, enterprise are looking for more professional logistics service vendors in succession. 3PL is selected in place of the private logistics systems of enterprises to take charge of part or whole of the supply chain logistics for it is informational, professional, networked and systemized. Therefore, the efficiency of the supply chain logistics is determined by the efficiency of the 3PL's logistics service. On the other hand, the logistic customer needs to know more, various information of the logistics since there exists venture of route as well as the ownership of the goods and the goods itself are separated. All of these bring several new requirements both on the 3PL service and on its logistics business process. How can a 3PL provide customized services according to different customer requirements and meanwhile its logistics process could be stable enough for long period of development is the main researching topic of this paper.

2. Characteristics of 3PL in e-commerce environment

3PL vendor is defined as a special middleman of logistics in channel who provides other enterprises with whole or part logistics business service, from generic transportation to design, execute and operation whole system of distribution and logistics in certain period by contract form (Duo Zhang, 2000).

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A 3PL vendor is a professional logistics company getting profit by taking charge of part or whole logistics in the supply chain of a focal enterprise. Nodes including supply chain are joined together by business process (Lambert and Cooper, 2000). As non-supply chain member nodes, 3PL connect their conjoint nodes with logistics agent business services such as customer relation management (CRM), order fulfillment, structural network design, stock management, transportation management, returns management, etc.

The 3PL appeared in advance of supply chain management and developed firstly within a very slow speed. In spite of its history of several decades, up to now 3PL still occupies a rather low fraction of logistics markets. Even in U.S.A, 3PL only contributes to 6% of related industries (Jian-me, 1999). The 3PL is in the initial stage of development in China and according to the interview of China Storage Association, only 5.9% of commerce enterprises and 18% of production enterprises outsource their logistics to 3PL vendors while the 3PL vendors haven't taken part in inner production logistics business of the production enterprises (Shao-ji Shen, 2000).

At the same time, the popularization of supply chain management provides a good developing environment and a huge required market for 3PL industry. In the fierce global competition an enterprise is faced with a buyer's market which is ever rapid changing and difficult to be forecasted. The consumers are also becoming more and more dominant in presenting their personalized and customized requirements.

Internet-based collaboration used in e-commerce enables the integration of logistics flow, financing flow, information flow, workflow and value-added flow. With the utilization of e-commerce, the 3PL company could frequently reengineer its logistics business process flow and thus improve the customer responding ability and service quality. The focal enterprise outsourcing its logistics to 3PL will decrease its logistics cost and the whole supply chain product stock and therefore, has more ability to accommodate the market's variation. Developing and improving of e-commerce based 3PL will turn the focal enterprises' logistics into a socialized, professional one. The professional logistics management of 3PL realizes the fast moving of products among valid supply chains and shortens both the distances from the producers to the consumers and from the supplying markets to the requiring markets. The 3PL companies and all the supply chain node enterprises will win for the improvement of the whole supply chain efficiency and the decreasing of its cost.

3. Integration of 3PL with the supply chain process

Being an associating node in a supply chain, 3PL vendor has a consignment-agency relationship with supply chain member enterprises. The building and maintenance of this relationship depends upon the realization of six core values, i.e. shared goals and objectives, trust, mutual dependence, concern for others profitability, open lines of communication, mutual commitment to customer satisfaction (Daniel H. McQuiston, 2001). As the appurtenant of the supply chain, the 3PL must regard the target of the supply chain members, the maximization of the customers' interest, as one of its main goals and takes its tenet as helping the customers realize their values-added. Therefore, whether the logistics business process or the management of the 3PL vender should be adapted to the needs of business process and management of the supply chain members. From the 3PL vendor's view, all the business processes of the logistics customers (the focal enterprise) are different and it must build a dynamic logistics business process to make it be able to be integrated with various supply chain business processes.

3.1. Reengineering of logistics business process

The most important steps in the inner 3PL logistics business process include management of customer services, product storage and product transportation. Compared with the supply chain business process, 3PL logistics business process has fewer and more stable customers and no supplier involved. The core competition ability of a 3PL vendor is its ability of integrated services to help its customers to optimize their logistics management strategies, build up and operate their logistics systems and even manage their whole distribution systems. Only by providing customized logistics services to various customers as an agency, a 3PL vendor could establish a long-term union relationship with its customers and enhance it continuously. Therefore, logistics agency allowing customization is an available 3PL mode suitable for being integrated with supply chains.

In the running of a supply chain, the 3PL vendor is charged with several logistics activities in procurement, transportation and storage of raw materials and machining, packaging and delivering of products. 3PL should take the advantage of its professional logistics ability and reengineer above logistics activities so that to be able to deliver given products to the receiver in a certain period and minimize the logistics cost as well. 3PL will connect the suppliers, the manufacturers and the distributors in supply chains and provide the substance movement and logistics information flow. The logistics value-added services are realized by the changes of the products' time and value states.

Available 3PL logistics business processes suitable for supply chain management include processes of customer relation management, customer service management, customer order fulfillment, structural logistics network design, stock management, transportation management, returns management, etc.

(1) *Customer relation management.* Its main purpose is to recognize the core customers and customer groups.