
COLLABORATION WITH A 4PL PROVIDER FOR THE IMPROVEMENT OF INFORMATION AND INVENTORY FLOWS IN THE TRANSPORTATION PROCESS

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Abstract: *In this paper, the complexity of supply chains is highlighted, due to the existence and interactions of multiple supply chain partners. A supply chain collaboration pattern is created, based on literature review, according to which, collaborative relationships must be cultivated among channel partners, in order to optimize the flow of accurate and on time information, thereby enabling the lean flow of inventory, through reduction of the transportation cycle time. To achieve this purpose, the existence of a supply chain integrator, namely a Fourth Party Logistics Provider (4PL), is imminent, in order to handle the complexity of the chain. This need is demonstrated through the analysis of indicative supply chain constructs, displaying the interaction points with intermediaries, and how these are simplified, through collaboration with the 4PL provider to effectively coordinate the end-to-end transportation process. Finally, the supply chain structures are demonstrated through a model.*

Keywords: 4PL provider, collaboration, supply chain complexity.

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1. INTRODUCTION

The design of the supply chain is a core activity, enabling supply chain managers to propose the optimal logistics network and determine the most suitable distribution channels, taking into consideration the number of plants, suppliers, production capacity, inventories etc. The degree of connectivity appears to play a significant role within the logistics network (Meepetchdee and Shah, 2007).

Organizations are recognized to be complex and adaptive systems (CAS) (Milgate, 2001). Supply chains can also be considered as CAS according to the parallelism provided by Wycisk, McKelvey and Hulsmann (2008), comparing the features of supply networks with CAS properties and behaviors. They suggest that heterogeneous agents, such as suppliers, manufacturers, distributor, commercial representatives, freight forwarders, 3PL providers, etc exist in both constructs, each setting individual goals based on differentiated action patterns. They also believe that interaction is also obvious in the supply chain, in order to properly facilitate the flow of information, inventory and finance. Co-evolution, to them, is evident, as well, since each partner's decision and action influences the entire chain. Finally, they also identify autonomy and self

organization within the supply chain network as individual agents decide and act without direct supervision, without an "outside controller".

The absence of a supply chain integrator preserves the main characteristics of complexity that are related to upstream and downstream uncertainty, technological intricacy and internal and external organizational systems (Milgate, 2001). Since the supply chain complexity directly impacts delivery performance of inventories, the present study will display that the complexity is reduced through close collaboration with "an outside controller", namely the 4PL provider.

In this paper, the significance of collaboration among chain members is presented that allows prompt inventory information flow, thus avoiding the "bullwhip effect" and consequences such as imprecise forecasts, partly exploited capacity, deficient customer service, inventory turns and costs, lack of prompt order fulfillment response (Shore and Venkatachalam, 2003; Caridi, Cigolini and De Marco, 2006). In the section of discussion, indicative supply chain constructs are examined and imprinted, highlighting the interactions among the chain members. Furthermore, the reduction of the interaction effects are indicated, due to the existence of a 4PL provider that operates, based on collaborative schemes, leading to the creation of a networked organization and the relevant supply

chain collaboration pattern, on which the partners' interrelationships must be based. In the final section of conclusion, suggestions are made, in order to further enhance the role of the 4PL provider and improve the information and inventory flows.

2. LITERATURE REVIEW

In this section a brief literature review on collaboration is presented, on which the supply chain structures and the proposed supply chain collaboration pattern are based.

2.1 The significance of supply chain collaboration

It is of pivotal importance that collaboration is embedded in the processes of information sharing, joint decision making, planning and problem solving, forecasting, distribution, network design, order fulfillment, capacity planning, logistics planning, production scheduling, mutual goals, investments, etc (McLaren, Head and Yuan, 2002; Sahay, 2003; Simatupang and Sridharan, 2005; Stefansson, 2006), in order to exceed the capabilities of a centralized system, and encourage the process of continuous learning (Chiu and Lin, 2004). Co-operation and coordination represent stages prior to collaboration. Co-operation is characterised by the existence of fewer suppliers and long term contracts. Co-ordination is achieved through information linkages, WIP and EDI linkages. What distinguishes these stages from the collaboration phase is joint processes and technology sharing. For the supply chain collaboration to be successfully implemented, inventory systems, information sharing techniques and IT advancements have to be developed, through common financial and relational investments from the channel partners (Maqsood, Walker and Finegan, 2007).

Although many attributes can be reported as vital to the creation of a solid relationship, the key components are trust, transfer of meaningful information and mutual dependence (commitment) (Gibson, Rutner and Keller, 2002). Trust acquisition by observation, trust acquisition by interaction and reputation based trust are enabling mechanisms for the efficient multimodal transportation process (Esfandiari and Chandrasekharan, 2001). Commitment, as an additional feature of collaborative partnership, depends on the contribution of channel partners and the prospects for relationship durability (Wetzels, Ruyter and Van Birgelen, 1998). Additionally, commitment prerequisites healthy communication and transaction- or relation-specific investments, leading

to partner coordination and cooperation (Sheu, Yen and Chae, 2006).

2.2. Supply chain structures

Taking into consideration the critical issue of collaboration, the paper recognizes the 4PL provider as the most suitable partner to undertake the reengineering of a supply chain, in that, as the leading firm and simultaneously being the team interface, is able to identify areas that generate revenue and value for both internal and external customers. The main goal is the optimization of inventory flow through the shrinkage of transportation cycle time, which contributes to the effectiveness of the network through the synchronization of best-in-class chain members.

In Figure 1, multiple patterns of supply chains are described that can all differentiate from each other in numerous cases. Moreover, there is not a fixed number of chain participants. For generalization reasons, all categories of third parties involved in the logistics process, such as third party logistics providers, freight forwarding firms, distributors, carriers, etc are considered under the name of "Intermediary". Furthermore, three indicative examples of supply chains are examined.

In case 1 the manufacturer (M) receives the raw materials or components from n separate inland suppliers ($S_1, S_2...S_n$) in order for the production or assembly to be executed. The intermediate parties that arrange the transportation can be either external distributors, third parties that cooperate with the supplier or even drivers of the suppliers' fleet. The accurate coordination of the components' arrival at the manufacturers' premises from all suppliers secures the agility of production within the scheduled time interval. In order to achieve this desirable outcome, the logistics manager of the manufacturer must consistently organize and disseminate the relevant information with the suppliers. Further to the production completion, the manufacturer has to arrange the shipment of finished goods to the retailer abroad. In overseas shipments, two agents are involved, i.e. the inland and the corresponding foreign one. Based on the terms of shipment, i.e CIF, FOB, etc, the intermediary (freight forwarder or 3PL provider) contacts a number of carriers, asking for rate offers, transit time, routing and space availability, so that the manufacturer decides which service to use. In case that no freight forwarder or 3PL provider existed, this procedure would have to be carried out by the logistics manager of the manufacturer. The critical point at this stage is the time consuming information exchange and re-evaluation of the carriers' offers.

The intermediaries at both origin and destination are responsible for the customs clearance, packing/unpacking, un/stuffing of container, transport to/ from port, etc. The logistics departments of both the manufacturer and the retailer normally co-ordinate these issues. In case the

retailer agrees to deliver the goods to the final customer, the transportation can be executed either by a 3PL provider or by an independent distributor. The critical point at this phase is the schedule formation with the distributor, so that the final customer receives the order on time.

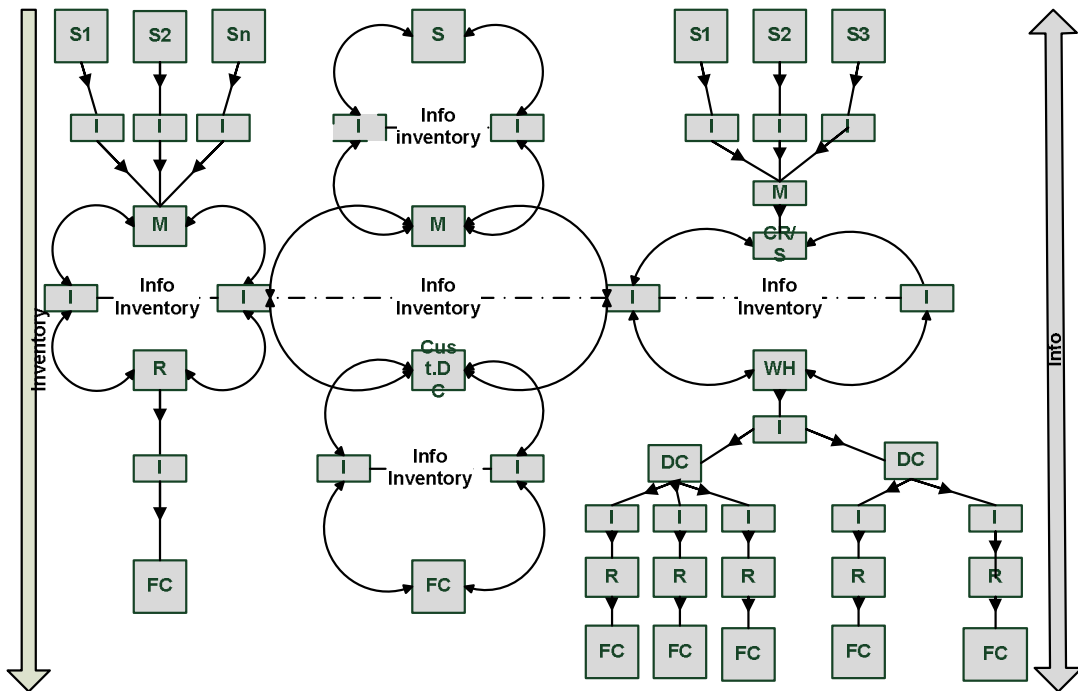


Figure 1. Supply Chain Structures

In **case 2**, another example of supply chain structure is presented, which is interlinked with case 1, in that either the manufacturer or the customer is included in the intermediary's customer base. In this chain, the supplier (S) is established abroad and exports raw materials or components to the manufacturer (M). Depending on the terms of shipment, the same procedure is followed as in case 1, regarding the overseas dispatch. The manufacturer arranges the shipment of finished goods to the Distribution Center (DC) indicated by the consignee. The Distribution Center may be established at a central region/ country that exports to the final customers directly. The involvement of intermediaries is imminent in this phase as well. This market can be assumed to be an on-line market.

In **case 3**, n inland suppliers (S) provide the manufacturer (M) with the necessary components for production, through distributors. The manufacturer commences the production and holds the inventory either at their premises or at a 3PL provider in order to respond to the shipper's (SH) needs. The shipper plays the role of the commercial representative (CR). Another option is that the shipper undertakes to warehouse the finished goods in order to supply the cooperative wholesaler at

destination accordingly. The critical point here is that the 3PL provider must occupy the appropriate facilities and Information Technology (IT) for the verification of visibility. The intermediary at origin must also undertake the export process in conjunction with the intermediary at destination. The wholesaler (W), on the other hand, has to be aware of the inventory levels at each stage of the chain, so that they can place replenishment orders. Moreover, the wholesaler arranges for the shipment of goods to different distribution centers around the globe. At this point, the close co-operation and collaboration with an International 3PL provider, freight forwarder, or carrier is of great importance, in order for the relevant data to be concentrated on one database. Furthermore, the distribution from the DCs to the retailers can be executed by independent distributors or the cooperatives of an intermediary, so that the goods are available to the final customers.

Based on the above indicative supply chain patterns, more than one buyer, supplier, 3PL provider, freight forwarding or transport company, in general, may be involved in one supply chain, due to global district barriers, and also due to the existence of multiple chain members. This leads to complexity increase, which in turn may result in

delayed and inefficient information retrieval and transmission, forecast errors and inventory accumulation. Manufacturers can avoid operational inefficiencies by taking the entire supply chain into consideration. The responsiveness to customers depends on the punctuality of all supply chain members (Lee and Billington, 1992).

Based on a research conducted by Babbar and Prasad (1998), the challenges to international sourcing can be summarized in JIT sourcing requirements, finding qualified foreign sources, logistics support for longer supply lines, culture and language differences, duty and customs regulations, fluctuation in currency exchange rates, knowledge of foreign business practices, nationalistic attitudes and behavior and understanding the political environment. Additionally, factors that influence success in global sourcing are top management

support, developing communication skills, establishing long-term relationships, developing global sourcing skills, understanding global opportunities, knowledge of foreign business practices, foreign supplier certification and qualifications, planning for global sourcing, obtaining expert assistance, knowledge of exchange rates and use of third-party logistics services. These affairs can be successfully confronted and fulfilled by a 4PL provider, representing the single point of reference in the supply chain network, through centralized control.

The above mentioned types of supply chain can become more agile and lean if all intermediaries are substituted by a 4PL provider, as shown in Figure 2, thus managing to reduce the transportation cycle time, by organizing the logistics processes.

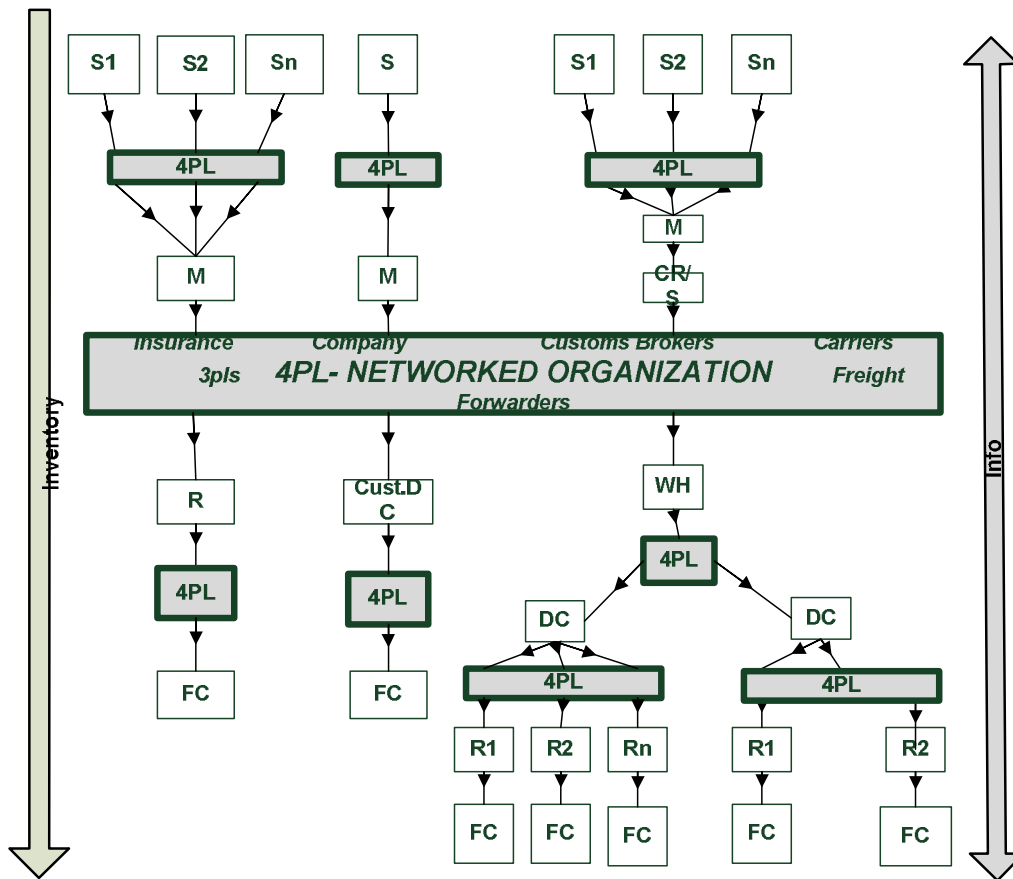


Figure 2. Supply Chain Management through a Networked Organization

Verwijmeren, Van der Vlist and Van Donselaar (1996), introduced the concept of the networked organization that is also adopted in this paper, as it accurately describes the role of the 4PL provider. According to their study, “a networked organization is an organization (company or business unit) with its own strategic control unit that co-operates with other organizations, on the tactical and operational

level, within its strategic constraints, in order to gain mutual benefits”. Furthermore, the organizations that comprise a network depend on long-term value adding relationships among synchronized enterprises, sharing mutual goals, responsibilities, accountability and trust.

These features represent the main characteristics of a 4PL provider and the overall idea of supply

chain networking. The attributes of the networked organization verify the outcomes of the extensive literature review, that the success of the 4PL concept is strongly related to the notion of supply chain collaboration. Integrating the components that

comprise collaboration, this paper suggests a Supply Chain Collaboration Pattern that can be used by supply chain consultants or internal auditors, in order to verify the existence of true collaboration.

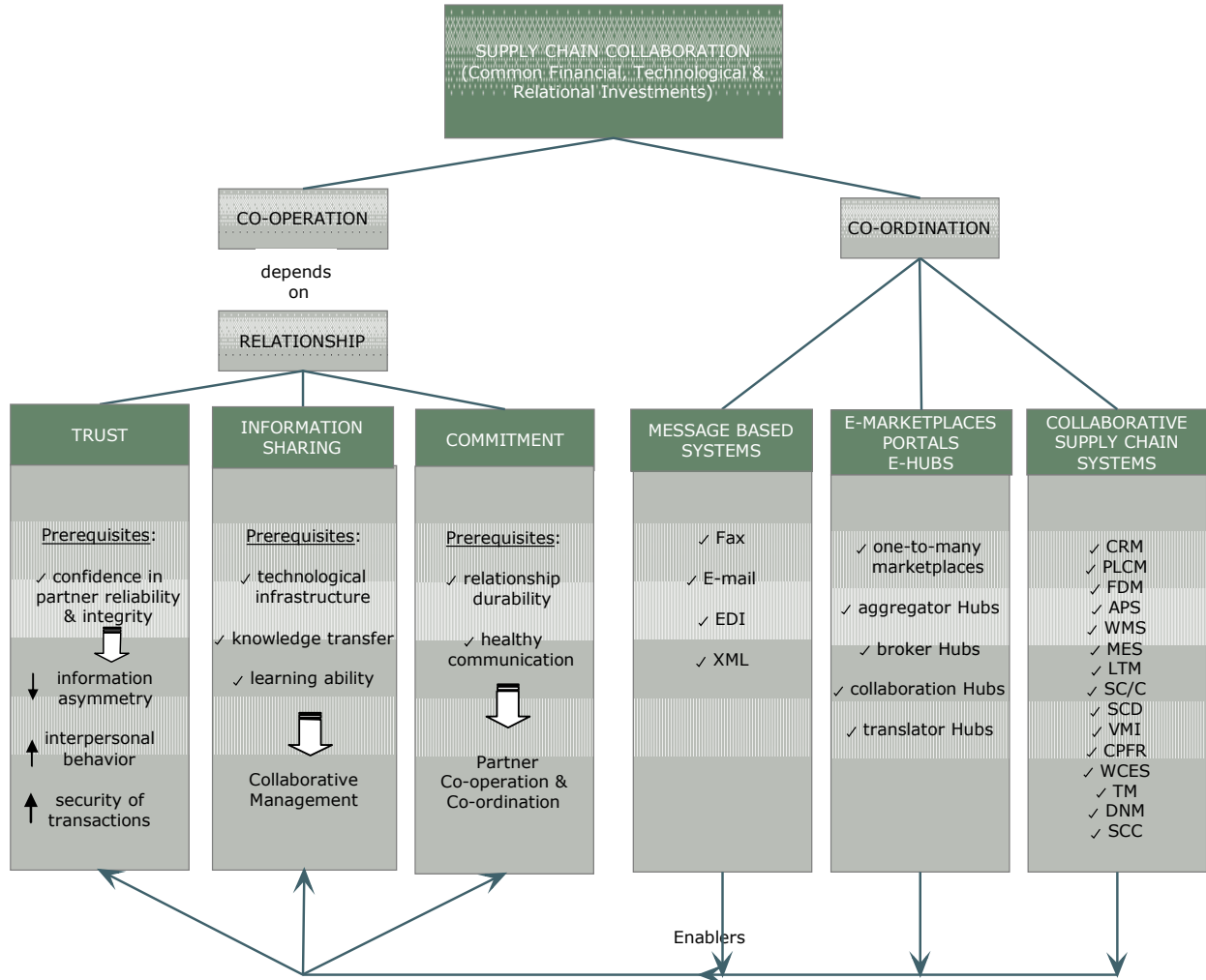


Figure 3. Supply Chain Collaboration Pattern

3. CONCLUSION

The need for synchronization imposes the necessity that the logistics departments at each echelon make intense efforts to coordinate and direct the structure properly. The existence of a supply chain leader is imperative, in order to identify the value generators and guide the supply chain towards this direction. A fourth party logistics provider can undertake this role, in that it can create a network consisting of all types of best-of-breed asset based providers, under an upgraded technological umbrella, thereby enabling flexibility and efficiency. Consequently, it can assist the future entrepreneur prior to the company establishment. Through a proper IT application, the 4PL can examine

numerous logistical scenarios on account of its customers, in order to decide on the appropriate construct of the supply chain.

Furthermore, through commonly shared Information and Communication Technology (ICT) systems, joint decision making and planning, product design, demand forecasting, production scheduling, distribution, order fulfillment, capacity planning are encouraged, based on mutual goals among the network partners. The collaborative environment, in which the 4PL operates, enhances the sharing of knowledge and experiences among partners, promoting continuous learning and improvement. The 4PL gathers information from all chain patterns, which it further assesses and disseminates the exact amount of information to the

relevant parties, avoiding to provide them all with unuseful details.

Furthermore, the 4PL can gather critical information about the economic, political and social conditions of each country through its global partners and disseminate it to the interested parties. Such process is of major importance taking into consideration that specific facts, such as a war can cause delays and lead to distorted flow of inventory.

To conclude, a 4PL represents a networked organization, sharing goals responsibility, accountability and trust. Networked inventory management can be facilitated by a sequence of co-operating and collaborating partners, aiming at quality optimization at all stages.

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