COMPLEX RELATIONSHIPS IN LOGISTICS MULTIADS: AN AUTOMOTIVE INDUSTRY INSIGHT

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Abstract: *The paper objective is investigation of complex relationships in supply chains and supply networks with a focus on logistics multiads. Supply chain characteristics and requirements strongly depend on industry segment. In ever changing automotive industry, complex supply chains are developing into multi-tiered international supply networks. Most papers in supply chain management focus on primary partners in supply chain, investigating its basic unit – logistics dyad (buyer-supplier relationship). In this paper, relationships with logistics service providers are included into analysis, aiming to get better insight into relationships following the theoretical concept of logistics triads in real environment. Within supply network, a logistics multiad is identified, briefly analyzed through dyadic relationships, and then aggregated into triads from different perspectives.*

Keywords*: Logistics outsourcing, logistics triad, logistics multiad, relationships, automotive industry*

1. INTRODUCTION

Supply network coordination and reliable interorganizational relationships between buyers, suppliers and logistics service providers are challenges for all specialists in supply chain management. Increase in number of participants in supply chains makes the coordination harder, the coordination risks increase, while the links become more vulnerable.

Overall success of supply chain depends on level of integration between all parties. Transparent, efficient and "seamless" material and information flows are among the most important preconditions, and also indicators of successful relationships in the supply chain.

Modern supply chains, and particularly supply networks build complex logistics multiads, which could be decomposed on logistics dyads or triads. Most of papers in supply chain management literature are focused on relationship between primary partners in supply chain and logistics dyad, i.e., supplier-buyer relationship. However, a contemporary approach indicates that a basic unit of analysis should be logistic triad – supplier, buyer and logistics provider.

Following this research stream, the paper objective is to explore applicability of logistics triad as a basic unit of analysis in a real and complex setup for describing nature of relationships. An

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example from automotive industry is used to illustrate complexity of problem and possible viewpoints in logistics relationships analysis. Within supply network, a logistics multiad is identified, analyzed briefly through dyadic relationships, and then aggregated into triads from different perspectives.

2. LOGISTICS TRIAD AS A BASE UNIT IN LOGISTICS RELATIONSHIP RESEARCH

In the literature on supply chain management, the most frequent unit of analysis is logistics dyad, which refers on supplier-buyer relationship. The triad relationships, as a more complex form, are much less covered (Larson and Gammelgaard, 2001; Skjoett-Larsen et al., 2003; Stefansson, 2006). However, increasing trend of logistics outsourcing, and significance of long-term and strategic logistics outsourcing arrangements have impacted that research focus was partly shifted toward logistics triad. Initially, logistics triad refers on shipper, receiver and carrier, as "a minimum unit of analysis" for logistics research (Beire, 1989). Later definitions and research highlight the importance of qualitative relationships, cooperation and integration between elements. Larson and Gammelgaard (2001) and later Stefansson (2006) describe logistics triad as a cooperative, three-way relationship between a buyer of goods, supplier of those goods and logistics service provider moving and storing the goods between buyer and supplier. Some authors also explore supplier-supplier-buyer triad within the supply network (e.g. Choi and Wu, 2009; Wu et al., 2010). These triads will not be considered in this paper, although some observations could be generalized and applied in such setup in future research.

Complex supply chains with high logistics requirements usually assume long-term contracts and strong relationships with logistics specialists, capable to meet all customers' needs and ready to develop own resources and solutions together with their strategic partners. Logistics service provider moves goods and shares information with all included participants, influences their relationships, and add the value to delivered product (Beire, 1989). He has a crucial role in terms of seamless information and material flows from primary supplier to end customer. He can provide single-service e.g. transport or warehousing, bundled services, integrated or highly customized solutions, and so be recognized as 2PL, 3PL, 4PL, 5PL or even 7PL provider. In complex supply chains and networks, there are usually several logistics providers with different roles who jointly work to meet customer needs. They may be connected horizontally, e.g. to be responsible for complementary parts of delivery according to Incoterms. They may be also connected vertically and create sometimes international and complex subcontracting logistics network between supplier and buyer, parties in successive supply chain tiers, or even in competitive supply chains. In all cases, introducing logistics triad as a unit of analysis, and a kind of "cell" which builds supply chain, may contribute to getting better overview on logistics relationships.

Forming additional interorganizational relationships could be also risky for supply chain on a whole. Among the main factors that cause a lack of logistics provider's integration within the triad are high customer demand for transport flexibility, disconnections between sales and logistics departments at the company level and lack of integration between carriers and customers (Sanchez-Rodrigues et al., 2010). Therefore, with the increase of the supply chain complexity, better integration with a logistics service provider is also needed.

Long-term relationships within the triad usually include cooperation and different types of integration both between "complementors" and competitors in supply chain. Collaboration assumes technical, technological, organizational and informational integration within and between organizations. However, it is not limited on exhaustive information exchange and good links at operational level of activity. If organizations integrate their processes only at an operational level, missing to do it on tactical and strategic levels, performance benefits of integration will be limited (Barrat, 2004). Integration in management means joint management in reaching common goals in supply chain, and common work on conflict of interests, which

implies good communication on strategic level of management and bridging cultural gaps (Barrat, 2004). One of the main common goals is to be more competitive than other supply chains in the same industry on the market.

Logistics collaboration primarily assumes collaboration in demand forecasts, inventory management and transport management between involved parties. Collaboration in some extent usually exists within strategic logistics contracts between companies, tending to make stronger, hybrid relationships and more porous boundaries between strategic partners in supply chain. These viewpoints will be briefly illustrated on a case study in the automotive industry.

3. LOGISTICS MULTIAD IN COMPLEX SUPPLY NETWORKS – AN EXAMPLE FROM THE AUTOMOTIVE INDUSTRY

3.1 Research methodology

To explore the nature of logistics multiads in real environment, a Tier 1 supplier to the original equipment manufacturers (OEMs) in automotive industry in Germany was observed as a focal company. Company's relationships were observed through purchasing and logistics processes and activities during the 6-month period. A comprehensive documentation and its flows were explored, including e-mail correspodention, financial documents, transport documents, reclamations, claims, certificates, reports about quality control, contracts with suppliers, buyers and logistics providers, etc. Interviews with employees on various hierarchical levels in sales and logistics departments have been also performed. The research aimed to identify the roles of main players in logistics multiad and main characteristics of their relationships by using logistics triad as a base unit for analysis. From the buyer side, one company was selected for the purpose of analysis. Two companies involved into multiad were identified as strategic logistics providers and the roles of both are briefly described.

3.2. Results and discussion

Automotive industry has seen a rapid change in the recent period, recording expanding requirements. Consequently, supply chains will require systemic transformational change to address new complexity. The way for improvement is integration of supply chain processes and activities across the supply network, more control and visibility into production delivery events and logistics costs and processes, and collaborative alignment with partners (Heaney, 2015).

Supply chain complexity and sourcing collaboration are recognized as major competing priorities and capabilities in automotive industry. There is also a strong increase of awareness among the companies in automotive industry that strategic supplier and logistics provider selection should be performance based and long-term focused. Across a complex set of competing priorities and across an evolving automotive marketplace, a need to coordinate supply chain activities and processes in a „multi-party, dynamic fashion" is recognized (Heaney, 2015).

Automotive industry is the largest industry sector in Germany, with the turnover of EUR 404 billion, or 20% of total German industry revenue, and with a workforce of around 792 500 in 2015 (GTAI, 2016). Further, Germany has the largest concentration of OEM plants in Europe. With 41 OEM sites located in Germany, German OEM market share in Western Europe was more than 51% in 2015 (ibid.). Our focal company belongs to this cluster as a Tier 1 supplier, directly delivering to the OEMs their customized parts for serial production of vehicles.

Observed company is lights manufacturer in automotive industry, here denoted as S, with more than 100 years long tradition in Germany. After a series of transformations, manufacturer became a part of global company, with production plants in US, Mexico, China, Germany and UK, while its majority shareholder is another global cross-industry company. Portfolio of buyers -

customers include mainly OEMs in Germany, delivering the customized parts to different production facilities globally.

All logistics processes are performed by four organizations – focal enterprise as a Tier 1 supplier S, buyer (here denoted as B), logistics intermediary and logistics provider. Logistics intermediary, here recognized as 4PL, is integrated with manufacturer through the ownership – both of them belong to same majority shareholder. Thus, complete supply, issuing the orders and execution is given to sister company - 4PL provider, while the supplier company is focusing on its core competences and providing the innovative development solutions and products for the customer. 4PL has an exclusive right to provide logistics services to S. Also, there exists high level of management, process and information integration through common Enterprise Resource Planning (ERP) system, common internal quality control, etc. These two companies act on market as the unique entity, after acquisition of S by major shareholder.

4PL provider owns only IT infrastructure and skilled staff. It doesn´t have own-account logistics infrastructure, facilities and capacities; thus, execution of the complete logistics service is transferred to 3PL provider, while management and control is kept by 4PL.

3PL provider has a long-term cooperation with 4PL through strategic and revolving contracts. 3PL is responsible for performing all logistics services for S and completely capable to perform transport, distribution and warehousing, reverse logistics, as well as all value-added operations - picking, packing, order assembly, labeling, inventory control etc. However, 4PL is responsible for distribution management. On operational level, 3PL is strongly informationally integrated with both 4PL and S. Buyer exchanges information about confirmed deliveries with 3PL, and operational, real time shipping information with 4PL. In that sense, 4PL act as a 3PL from the buyer's perspective, while 3PL has a role of carrier. 3PL-B relationship is the slackest one in multiad; it is completely defined by contract clauses between supplier and buyer, as well as between 4PL and 3PL.

After executing logistics service, 3PL provider service is evaluated by the 4PL. The performance reports are regularly made and submitted to the S management, the overall key performance indicators are reviewed and the buyer's satisfaction evaluated. All three companies exchange relevant information in real-time; however, 3PL does not have a common information system with other two companies. 4PL is responsible for all order processing and their transformation into logistics demands to 3PL. It was noticed that their common work give efficient, flexible and responsive logistics chains even in case where buyers change demands.

Primary buyer - supplier relationship is based on revolving short or middle-term contracts for supplying with specifically designed products. Supplier has to provide reliable dynamics of delivery and expected quality of products and logistics service to the buyer B in Figure 1. Crucial contract elements are: price, quality, reliability of service and contract duration. The S-B relationship is actually based on a competitive bidding model. The buying company is always searching for the cost reductions in order to increase its own leverage. Global sourcing supports replacement of the actual supplier on a price and performance base. Due to this situation, only operational level data are shared – forecasts, inventory levels, pricing, supplier performance reports, allocations, etc. Although they are strategic partners, S is not motivated to establish higher level of informational integration with B, to share all information, to work proactively and, most important, to invest its engineering and logistics knowledge and experience in order to continuously improve the existing products. The main focus stays at the fulfilling the contract obligations as a supplier. Thus, this relationship seemed to be the weakest chain in the multiad, due to internal risks.

First insight into relationships in observed multiad shows that parties create different kinds and levels of dyadic integration in term of common planning and management, informational integration, functional integration, share of operational and strategic interests. If we would like to present four main elements as logistics triad by aggregating two elements in one, we could

use at least two triads, depending on criteria and focus of analysis. The reason is that in reality, the triad is usually not built as an equilateral triangle, and particularly not from different perspectives – organizational, functional, information integration, power balance, trust, shared interests, etc. If we recognize that stronger dyadic relationship brings closer some parties, like a "glue", we could get a criterion for aggregation parties into logistics triad.

Two strong relationships were identified - between S and 4PL, and between logistics providers. Following them, multiad is transformed into two logistics triads. In functional sense, 4PL and 3PL can be integrated into logistics party within the triad (Fig. 1a). However, supplier and 4PL provider could be also observed as unique element in triad, following the same ownership, high organizational, managerial and informational integration (Fig. 1b). Therefore, multiad could be transformed into two logistics triads for the purpose of analysis. Both triads can be argued as appropriate for describing the system, and both have some advantages and weaknesses. Depending on focus and aims of analysis, researcher could select more suitable aggregation in a particular case.

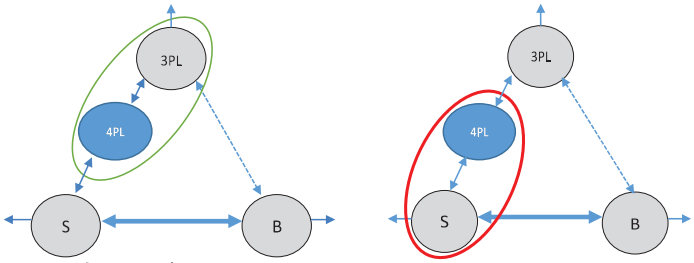

Figure 1. Possible aggregation of elements into logistics triads within logistics multiad

Involved parties both share interests and have some conflicts of interests with all other parties in multiad. In real environment, conflicts and shared interests, both operational and strategic, may be changeable, or their importance may be changeable for parties. Thus, they should be reconsidered after significant market changes, or before contracts revolving.

Standardized processes, clear roles and tasks among the partners, functional and operative integration are important in forming and development of collaborative relationships as an ultimate goal in integrated supply chains.

To increase the overall competitiveness of the supply chain, partners included in logistics multiad should clearly recognize and continue to develop common goals, talk about risks and conflict of interests and ways to hedge them. Supply chain strategy and related goals should be commonly identified, and aligned with logistics and transport outsourcing goals (Stojanović et al., 2013). Further integration within the multiad is possible with active involvement of all parties, following path from the strongest dyadic relationships toward the weaker ones. Building these relationships could bring to the full information sharing and, more important, to proactive collaborative work on improvement of existing products in terms of design and engineering, increase of production efficiency, improvement of logistics services and ensuring a more coherent supply chain.

4. CONCLUSION

Increasing complexity of processes, growing logistics requirements throughout supply chains, number of engaged players in logistics chains, as well as organizational and functional interdependence impact on growing need for complex logistics multiads in automotive industry.

One of such multiad was analyzed by using contemporary theoretical approach for logistics setup – logistics triad.

Triads can be created by decomposition or aggregation of elements in supply network. Case study exemplifies that aggregating parties within the multiad could create different triads depending on focus of analysis. In observed case, triads were formed from organizational and functional perspectives. Further research of examples from different industries, particularly in complex setups, may contribute both to better understanding of collaborative relationships and their further development in practice.

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