

Implementation of the Supply Chain Management Concept in Seaports – Requirements and Challenges

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The dynamic changes in the global economy has caused the rapid growth of transport needs. Outsourcing and off-shoring has increased the distance between the particular places where the production process is provided. Therefore, logistics has become more macro-scale than before. Maritime traffic is therefore the main transport mode served a global movements of goods. Such companies like Maersk, NYK or Hanjin are today a global transport players offering a wide scope of service. Proper functioning of maritime transport needs also a good developed system of seaports. Effectiveness and efficiency of global transport is depend on seaports infrastructure, equipment, staff and management. So, seaports has become a critical element of supply chains concept. In the following analysis, the relation between the main requirements of supply chain management (SCM) and contemporary practice of seaports management are investigated. The type of port management systems and its operation model will reflect on the possibility of implementation of SCM. In the last part of presented elaboration main pros and cons of particular solutions of port management are defined and indicated.

Keywords: supply chain management, logistics, seaport, maritime transport, port authority.

1. BASIC ELEMENTS OF SCM CONCEPT

The necessity of improvement of goods movements efficiency and effectiveness, both in national and global scale have caused the implementation of wide scope of logistics solutions. The main task of that process is "... to planning, implementing and controlling the efficient, effective flow and storage for goods, services, and related information from point of origin to point of consumption"¹. Unfortunately, the traditional attitude to the logistic service had not managed with the increasing scope of market challenges. The main reasons of that problems was the hard competitiveness on the market and globalization process. It could be stated that, the logistics activity was limited only to the goods, service and information related to the main flow. In reality, much more other aspects and relation

have significant influence on final success of these flow. For that reason, the concept of supply chain management (SCM) had been developed and implemented.

"SCM is the network of facilities and activities that performs the functions of product development, procurement of material from vendors, the movement of material between facilities, the manufacturing of products, the distribution of finished goods to customers, and after-market support for sustainment"². These activity could be also defined in the framework of tree-component normative model of SCM, as the integration of business processes from end user through original suppliers that provides products, services, and information that add value for

¹ D.M. Lambert, J.R. Stock, L.M. Ellram: *Fundamentals of Logistics Management*. Irwin McGraw-Hill 1998, p. 504.

² M.C. Mejza, J.D. Wisner: *The scope and Span of Supply Chain Management*. "The International Journal of Logistics Management". Vol. 12. No. 2 (2001), p. 37.

customers³. Despite, the customer is the crucial element of supply chain (SC) operation, the added value generated through the whole chain should be also shared between partners. In other words, the participation in the supply chain have to be profitable.

It could be stated, therefore the scope and area of supply chain activity is much wider than traditional logistic. In SC management, despite the aspects directly connected with the main process of transformation, additional areas have to be take into consideration (figure 1).

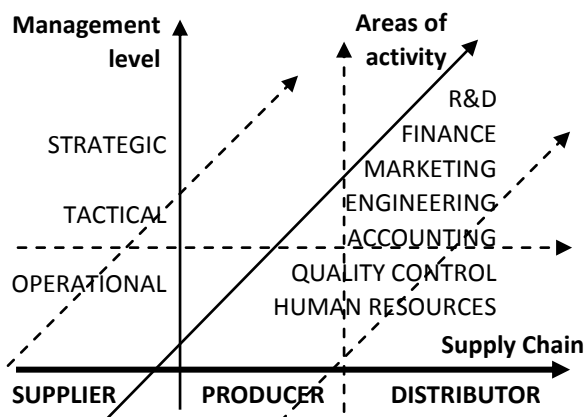


Figure 1. Three-dimensional model of supply chain interconnections.

Source: Author's own elaboration

The attention should be extended on the following non-supply groups:

- engineering/production (evaluation technical capabilities to better use existing capacity, interact with supply managers during product development);
- marketing (to better understand the demand and develop accurate and timely demand requirements, share end-customer requirements with SC planning groups);
- finance (validate costs savings from SC, identify impact of SC on corporate performance, assess the impact of inventory improvements);
- accounting (providing accurate data to support internal and external cost analyses);

- quality control (better understanding of customer needs),
- R&D (to quickly respond to new customer needs with a new products and technologies),
- IT (to be able to share important business information across supply chain, which in supply chain plays role like a blood in a human body);
- Human resources (support the recruitment, provide training and education programs related to SC knowledge and skill areas);
- Legal (perform timely and effective reviews of SC contracts)⁴.

Additionally, not only companies engaged into physical flow of goods or information have influence on the success of supply chain. There exist many of, so called 'non-supply' players which are crucial for final efficiency of SC.

The composition of supply and non-supply groups engaged into management process through SC should be focused and integrated horizontally in the framework of main business processes, like: customer relationship management, customer service management, demand management, order fulfillment, manufacturing flow management, procurement, product development and commercialization and returns channel process. The key concerns of particular aspects are presented in table 1. Besides those classical business processes, the additional aspects regarded as condition of successful SCM are indicated: executive support, leadership, commitment to change and empowerment⁵. Proper management of supply chains in presented dimension needs the coordination and integration of numerous aspects. Of course, the structure of particular business areas and challenges for the regulation is related to the specific type of SC. Nevertheless, the common features of SCM process could be pointed:

- facilitation of effective and efficient two way flows of products (goods and service), information and funds,

³ D.M. Lambert, J.R. Stock, L.M. Ellram: *Fundamentals of Logistics Management*. Irwin McGraw-Hill 1998, p. 504.

⁴ R.J. Trent: *What everyone needs*. "Supply Chain Management Review". March 2004, p. 53.

⁵ D.M. Lambert, J.R. Stock, L.M. Ellram: *Fundamentals of Logistics...* op.cit., p. 504.

- they are controlled by various managers, and supply chain leader should be able to coordinate them,
- there are conflicting goals of SCM processes, hence SCM boils down to managing trade-offs between processes⁶.

Table 1. Processes being integrated across supply chains

Process	Key concerns
Customer Relationship Management	Identifying key customer target markets, and developing and implementing programs with key customers
Customer Service	Providing on face to the customer using on-line information systems with current information about the order, as well as production and distribution status. This process also provides product information to the customer
Demand Management	Recognizes that the flow of materials and products is intertwined with customer demand. Forecasting and reducing variability are key concerns of this process.
Order Fulfillment	Provides for timely and accurate delivery of customer orders with the objective of exceeding customer need dates.
Manufacturing Flow Management	Concerned with marking the products that customers want. This is resulting in manufacturing processes that are more flexible and efforts to have the right mix of products.
Procurement	Focuses on managing relationships with strategic suppliers. This objective is to support the manufacturing flow management process and new product development.
Product Development and Commercialization	Focuses on integrating key customers and suppliers into the product development process in order to reduce time to market.
Returns	Focuses on recovering the greatest value from reverse product and materials flows, with emphasis on recycling, rescue, and source reduction.

Source: M.C. Cooper, D.M. Lambert, J.D. Pagh: *Supply Chain Management: More Than a New Name for Logistics*. "The International Journal of Logistics Management". Vol. 8, No. 1 (1997), p. 1-13.

Important issue in the supply chains analysis and development is the chain dimension. There are defined two dimensions of SC: horizontal and vertical. In the first issue the size of chain is determined by the number of tiers (suppliers or customers) across which process is integrated. The following, model horizontal sizes of SC could be indicated:

- Internal SC (related in the inner-company processes);

⁶ B. Rodawski, A. Baraniecka: *Do you really manager your supply chain?* "Pharma Poland News" PMR Publications. Issue No 2 (15) – 8 June 2007.

- Direct/Narrow SC (taking into account only the first tier of suppliers and customers of focal companies);
- Extended SC (the transitional scope);

Ultimate SC (included all companies engaged into flows between primary supplier to final customer and all kinds of processes connected with these issue).

In case of vertical scope, the number of first-tier suppliers or customers characterized the scope of chain. In case of multi-horizontal and multi-vertical structure, the supply network management is defined. The spatial analysis of the chains dimensions could also indicate on micro, mezo and makro supply chain.

Before the SCM concept implementation, the crucial decision concern the key areas in the supply chain should be answered:

1. The number and types of business processes to integrate,
2. The supply chain network over which they are integrated,
3. The aspects of general management to focus the integration upon.

Important goal of SCM concept implementation is to encourage managers to think beyond their companies' boundaries to integrate business processes between successive members of supply chain. On the other hand, the concept could be effective only in case of existing of real influence of SC manager on the decisions made by other partners through chain. It means, that the particular partner-companies have to partial defer to the leading SC manager/company.

To summarize, the following pillars of successful supply chain management implementation could be indicated:

1. *Horizontal structure*: evolution from functional to horizontal business structure – the SC manager should coordinate the process not the function;
2. *Multifunctional scale*: including all processes and aspects of activity (supply and non-supply);
3. *Partnership* between all SC members;
4. *Share of information*: free movement and accessibility to information.

Thanks that, the numerous of benefits should be gained. The most important positive changes connected with the SCM implementation are: drastic reduction in required inventories, shorter cycle times, and lower distribution costs to each member of a given set of firms interacting on a customer-supplier basis⁷.

2. SYSTEMS AND MODELS OF ORGANIZATION OF SEAPORTS MANAGEMENT

The modern seaports belong to one of the most complex organizations operating in the transport sector. This is due to several essential factors. On the one hand in the port area cross the different modes of transport. What is more in each of them can operate a different system of ownership, management and organization. Similarly, the seaports because of its strategic role for national economies remain under the supervision or jurisdiction of the public authorities. In addition, there may be several management models that define the structure of both its ownership and the degree of relationship between the port operators and public authorities. Therefore, it should be indicate four types of seaport players⁸:

- 1) Public administration, which constitutes a central authority (the Government), local or regional authorities;
- 2) Port authority, sometimes called the port administration, i.e., management of the port area and basic infrastructure;
- 3) Companies rendered service for seaports customers (stevedores, forwarders, terminal operators, control companies, agents, shipping companies, etc);
- 4) Seaport users (i.e. cargo owners, shippers, passengers, rail companies, road haulages).

Above presented structure could be also analyzed from the supply chain point of view. The companies for the level of 3 and 4 could be called

as the "supply" players. There are strictly engaged into physical movement of goods (or passengers). At the same time, the rest of players have a position of non-supply part of SC. Such elements like: infrastructure development, safety regulation or seaport traffic management should be included into decision process of supply chain management.

The organization of the seaports management system is the second issue important in the process of implementing of SCM in seaports. There are four main systems, like: autonomous, municipal, national and private⁹. Of course, these options do not fulfill a set of possible structures of the organization. The management of seaports or dedicated terminals could be provided by public or private carriers or industry producers. On the other hand, a complex systems based on the mix of solutions are in use. For instance, in Poland the municipal/national system has been implemented.

The next distinguishing aspect of the functioning of seaports is the range of port services provided by the port authority. The most common models include¹⁰:

- *Port service model* (so-called 'full-service'). The port authority is responsible for maintaining of the infrastructure and equipment, and provides all kinds of services related to the handling of cargo and ships. For that reason, there is no competition in the area of operating, so the reduction in quality and an increase in the rates for port services could occur.
- *Tool port model* (so-called 'service'). In that model of seaports management the infrastructure issues belong to the port authority, and the provision of services is left to private companies. Port authority may, however, provide the necessary "tools" for private firms (i.e. cranes, tractors, ramps). Although in this solution a several companies can render service on the port area but actually the mechanism of competition still remains

⁷ J.J. Kanet, A.R. Cannon: *Implementing supply chain management lessons learned at becton dickinson*. "Production and Inventory Management Journal". Second Quarter 2000, p. 33.

⁸ A.S. Grzelakowski, M. Matczak: *Ekonomika i zarządzanie przedsiębiorstwem portowym*. Wyd. AM w Gdyni 2006 r., s. 113.

⁹ K. Misztal, S. Szwanowski, *Organizacja i eksploatacja portów morskich*, Wydawnictwo UG, Gdańsk 1999, s. 107.

¹⁰ Chlomoudis C. I., Pallis A. A., *European Union Port Policy. The Movement Towards a Long Term Strategy*, Edward Elgar Publishing Limited. Cheltenham, UK, Northampton, MA, USA 2002.

limited. Port authorities determinate the access to the handling equipment.

- *Land lord model* – The port authority is only the owner of port areas and infrastructure, while handling equipment belongs to private companies operating on the leased areas. This model allows for a significant increase of competition between the companies. The proper management of the independent company becomes a precondition of success on the market.

3. SEAPORTS IN THE SUPPLY CHAIN MANAGEMENT CONCEPT.

One of the crucial aspects of the proper functioning of supply chains is a rapid and flexible transport system. It is also the basic factor for economic development in the national and global scale. The second of mentioned issues is strictly connected with the maritime transport and seaports activity. Process concern the relocation of industry and service centers to 'cheap' labor countries (outsourcing and off-shoring), spatial discrepancy between the sources and consumption regions and growing value of intercontinental foreign trade has caused the significant development of seaborne trade. In the period of 1990 – 2008 the traffic volume has doubled (fig. 2).

Despite, the concept of SCM should include all kinds and types of flows (extension from resources till final products), the most important market area for them is container traffic. In these case the growth of last decade was even faster than total seaborne trade. What is important, the utilization of container technology was implemented because of necessity of flow speed increase (in case of bulk cargo the time of transfer is not so crucial). For that reason, the supply chain management concept is perfectly fit to the container market.

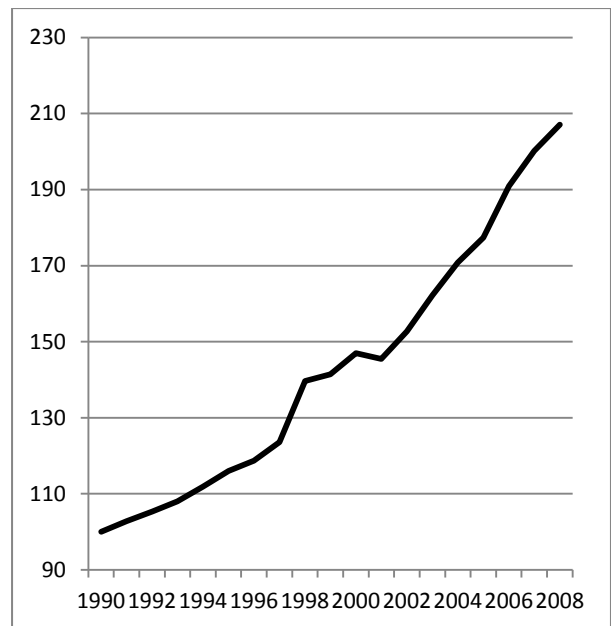


Figure 2. Global seaborne trade development (1990 = 100)

Source: Review of maritime transport 1997 – 2008. UNCTAD.

Similar situation, is observed in contemporary seaports as crucial parts of international supply chains. So far, the engagement of seaports in the value added creation in SC framework was connected with its development generation (table 2). The last identified stage of functional improvement was the seaport of fourth generation - *seaport as logistic centre*¹¹. The main task of operation was the rendering of high quality service and creation of added value for seaports. To compare these attitude with the information content in first chapter, the concentration on only the flows (goods, service or information) is not enough in the light of contemporary market requirements. For that reason, the implementation of SCM in seaports has become an important area of changes. To be more precise, these process should be regarded the implementation of the seaports into supply chain management concept.

Today's seaports are multi-functional and multi-entities economy centers, therefore they role

¹¹ P. Alderton: *Port Management and Operations*. Op. cit. p. 101. Based on *Port Marketing & the Challenge of the 3rd Generation port*. UNCTAD Report 1990 and *Maritime Policy and Management*, Volume 31, No. 2, on the Workport Model

in the SC concept could be analyzed at least in two dimensions. On the one hand, seaport itself is very sophisticated system, so the internal SC could be developed. It is important, that the type of seaport administration could caused these process less or more complicated. The relatively easy way of implementation is connected with the extreme solutions – public or private types (see Chapter 2). In these case, the decision makers are responsible for all kinds of port activities and functional areas, so necessity changes in the organizational issues are much more easy to implementation. In case of immediate solution of port administration (autonomous, municipal) the creation of horizontal structure on the basis of vertical interrelation between particular decision makers is difficult. These challenges are connected with such elements, like:

- Variety of land, infrastructure and suprastructure ownership structure;
- Different goals of activity (trade-offs, like: public service or economic efficiency);
- Multi-centers decision process (e.g. public, municipal, private);
- Focusing on the different level of values.

The second and even more important scope is the ultimate SC. The service rendered by ports is just an small part of supply chain. Although, the operation effectiveness and efficiency of seaports have an significant influence on the SC success. According to the theory of constrains (TOC)¹², the seaport remaining out of the SC management interest could became a ‘bottleneck’. It do not refers strictly to the technological capacity (infra- or suprastructure) but rather to the management and strategy issues.

From that point of view, important constrain in the SCM concept implementation are existing in seaports. I refers especially to ports organized as landlord and tool type because of necessity of complying of activity with supply chain requirements (supply chain manager). It is connected with both personal opposition and formal issues (multi-centers structure). There is also an crucial trade-offs concern the public and private priorities in the seaports operation and development. Besides the problems presented above, another constrains of supply chain

management concept implementation could be presented - type of ports. Most important factors determinating susceptibility of different types of seaports to utilization of SCM concept are described in table 2.

Table 2. Constrains of the SCM implementation in relation to the ports administration type.

SCM PILLARS	PORT TYPE		
	LANDLORD	TOOL	SERVICE
HORIZONTAL STRUCTURE	Independence between port authority and operational issues – lack of interrelation	Partial influence of port authority on operational issues - creation of unfair competition	Easy way of implementation – operational flexibility
MULTIFUNCTIONAL SCALE	Main functions of SC are shared by port operators and chain partners. Limited influence of port administration	Trade-offs between port authority and stevedoring companies, division of functions	Full scale of functional engagement into supply chain by the port
PARTNERSHIP	Partnership between private operators and stevedores, out of seaport responsibility, relatively flexible solution	Service rendered by independent stevedores, out of port responsibility, creation of inner competitiveness	Direct relation between SC partners, full engagement of seaport
SHARE OF INFORMATION	Depend on private operators, support from authority in IT infrastructure development	Service rendered by port, the suppliers and receivers of information from outside the port	Full range of cooperation in information sharing, directly depend on the port administration

Summing up, it should be ascertain, that only two models of port management, namely autonomous with *landlord* type of port authority and primarily *private* one, are most open towards the surrounding environment and its dynamic changes. Both, however, private model with much greater elasticity, are able to adopt to all new changes and challenges, especially those connected with market reorientation and logistics concepts of supply chain management. In contrary to other port management models, both are not burdened with not clear enough intra-port relations between the port governing body and stevedoring companies, and as such, are suitable for better port integration into the transport system, transport markets,

¹² B. Rodawski: *Supply Chain management under Theory of Constrains*. Author's analysis 2007.

commodity markets and transport chains as well as international supply chains.

4. SUMMARY

Implementation of SCM concept in the seaports or including seaports into supply chains management system is a huge challenge. Similarly, it is an only way to keep particular ports in global transport business. It should be emphasized that, not a seaport (whole infrastructure and equipment) will become an element of SC but rather particular dedicated terminals (for container) served one or two shipping companies. For that reason, the system and model of seaport management is such important issue. In that situation, the market attitude and business orientation of the port authority, regardless of the model or management system, is the most important factor for successful utilization of SCM concept.

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