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SKEMA Consolidation Study

Guidelines for selecting strategically important logistic concepts

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SE3.1 Dominant trends in logistics and supply chain management

3.1.1 Review of well known logistics concepts adopted during last decade

3.1.2 Guidelines for selecting strategically important logistic concepts

3.1.3 Supply chain integration and intelligent logistics - solutions and benefits

Abtract

This study aims at clarifying the complexity of supply chain decisions and offering guidelines for selecting strategically important logistics concepts. Also the roles of ports in different logistics concepts are described. A short sea shipping case study and a case study using maritime back-up solution are presented.

Globalization, sustainability, transport chain, replenishment lead-time, product, and demand are the factors affecting the selection of a logistics concept. Replenishment lead-times and predictability/variability of demand, in addition to the nature of the product and its lifecycle, are the key dimensions. Lean concept works well where demand is relatively stable and variety is low. Agile system is demand-driven and able to match supply and demand in turbulent markets. Leagile approach combines lean and agile principles and suits for long lead time products with unpredictable demand. Supply chain concepts create different roles for ports for better integration to supply chains and for improvements in terms of cost reduction, delivery quality and shorter cycle time.

Overview of automated identification technologies – advantages and selection criteria

Contents

1. Objectives

This study aims at clarifying the complexity of supply chain decisions and offering guidelines for selecting strategically important logistics concepts. Also the roles of ports in different logistics concepts are described. A short sea shipping case study and a case study using maritime back-up solution are presented.

2. Target stakeholders

- D2D Service Providers**,** which include ship operators, freight forwarders, logistics providers and Motorways of the Sea (MoS) operators
- Exporters & Importers (shippers)
- European ports, national port bodies and especially small-to-medium ports
- Research organisations, Systems Developers
- The large number of specialised companies that support the Maritime and Logistics industry; this includes bankers, financiers, designers, builders, providers of Single Window (SW), Port Community Systems (PCS) and Cargo Community Systems (CCS
- The European Commission and national transport ministries

3. Glossary terms

ICT Information and Communication Technologies
VMI Vendor Managed Inventory

4. Approach

Input bases on literature and a case study presented in EU project PROMIT.

5. Specific areas to be addressed

5.1 Maritime and logistics industry guidelines base on impacts analysis of logistics concepts and trends

Year 2002 Report on Trends and Issues in Logistics and Transportation is an analysis of current trends in logistics and supply chain management. Based on survey responses from more than 365 logistics professionals, the study emphasizes the benefits of creating visibility in the firm through key supply chain processes. Six drivers of adaptive Supply Chain excellence are:

- Collaboration,
- Optimization,
- Connectivity,
- Execution,
- Speed, and
- Visibility.

In an environment characterized by global supply chains, heightened uncertainty, increasing product complexity and ever-increasing customer demands for higher service at lower costs, how do leading companies continue to drive superior costs, service and quality performance through their supply chains? The ELA / AT Kearney study 2004 demonstrates the effects of increasing complexity of supply chains:

- Larger share of purchases and sales outside Western Europe leading to longer and more complex supply chains that are less failure tolerant
- Ever increasing customer requirements regarding service levels, especially with respect to lead times and delivery reliability
- Increasing amount of value added service, shifting activities that traditionally belong to manufacturing into the distribution centres
- Higher product complexity, manifested in shorter product life cycles and arising number of stock keeping units

It is generally accepted that “one size does not fit all” when designing supply chain strategies for a wide range of products with different characteristics sold in a diversity of markets. Functional products have generally stable and predictable demand with long

life cycles. Innovative products, on the other hand, tend to have unpredictable demand with short life cycles. (Christopher et al. 2006)

In a global commerce where supply exceeds demand there is a risk of sub-optimization in costs. For example just-in-time delivery lowers customer's inventories but may increase supplier's inventories and increase transport costs. To avoid sub-optimization supply chain decision should strive for enabling marketing objectives. (Christopher et al. 2006)

Selecting logistics concepts is a complex task where different aspects need to be taken into account. ***Figure 1*** illustrates a decision support tool which helps to understand the complexity and interactions between different dimensions. This support tool is generic but interactions may vary depending on a specific case.

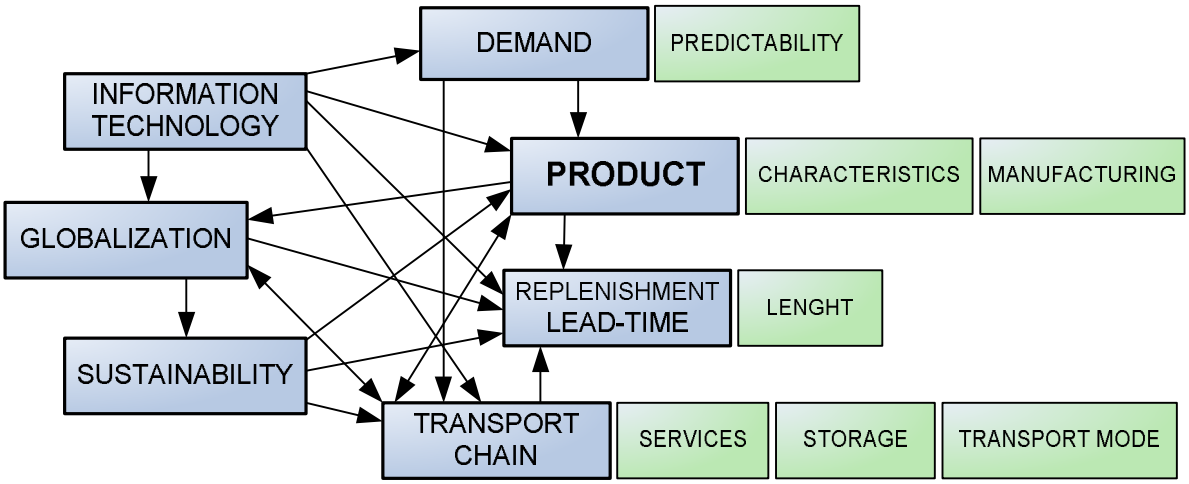

Figure 1. Logistics Decision Support Tool (Eckhardt 2008, own work)

Globalization: Lower production costs in developing markets (Asia and South America), standardized production processes and growth of outsourcing makes global production an interesting option. Increased use of information and communication technologies (ICT) and decrease in transport costs enhance globalization.

Sustainability: Globalization has a negative influence on sustainability due to longer transport distances.

Transport chain: Important product characteristics, such as weight, size, and value usually dominate the transport decision (Gattorna & Walters 1996 in Eckhardt 2002). Globalization increases over seas transport remarkably and may increase the need for storage. Sustainability can for example increase the use of intermodal transport and environment friendly transport modes such as rail and sea freight. Information technology for example reduces the need for storage, enables additional services such as tracking and tracing, and helps to optimize transportation capacity and routes. Demand characteristics influence the need for safety stocks and/or in some product types the choice of transport mode.

Replenishment lead-time: Product characteristics and design affect manufacturing lead time. Information technology improves visibility and reduces information lead time. Sustainability may reduce lead time by implementation of ISO 14000 standards. Globalization results in longer distances which causes longer lead times (Christopher et al. 2006).

Product: The product is the basis for logistics decisions. Every variable has an interface with the product. Information technology may improve product design and manufacturing processes. Sustainability improves product quality (ISO 14000) and taken into account design for reuse and disassembly. The choice of transport mode affects product pricing (Gattorna & Walters 1996 in Eckhardt 2002). Good demand predictability smoothes production flows.

Demand: Information technology improves demand predictability by greater transparency and better forecasting patterns.

Replenishment lead-times and predictability/variability of demand, in addition to the nature of the product and its lifecycle, are the key dimensions. Christopher et al. (2006) proposes a matrix of two dimensions - lead time and demand predictability- for selecting global supply chain strategy (***Figure 2***). (Christopher et al. 2006)

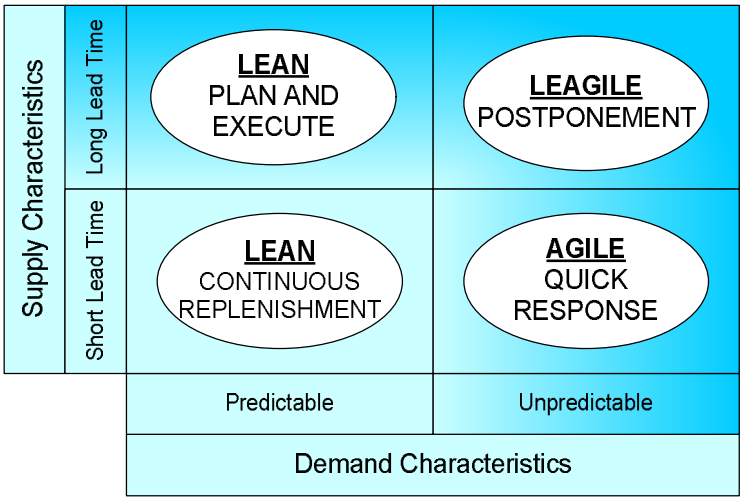

Figure 2. Taxonomy for Selecting Supply Chain Strategy (Christopher et al. 2006)

The idea of lean thinking is to reduce or eliminate waste. Lean concept works well where demand is relatively stable and variety is low. Agility is about flexibility and responsiveness. Agile system is demand-driven and able to match supply and demand in turbulent markets. Leagile approach combines lean and agile principles. For example lean principle can be used when designing supply chain for standard products and agile principle can be used for special products. Or the total demand of a product can be divided into base and surge demand. Base demand is more predictable so lean concept can be applied, while agile approach is used for surge demand. The same product might require different supply chain concepts in different stages of the product life cycle. (Christopher et al. 2006)

In a situation where demand is predictable and lead time is short, *continuous replenishment* may be an appropriate strategy. For example by using point-of-sales data and vendor managed inventory system a supplier can rapidly replenish individual customer inventories. (Christopher et al. 2006)

At the other extreme the ideal solution for unpredictable demand and long lead-times is the classic *postponement* concept. For example semi-finished special products can be shipped around the world to regional centres, run by third-party logistics service providers, where products are finally configured and delivered when actual customer orders are received. For a standard product it might be better to postpone distribution. (Christopher et al. 2006)

If lead-times are long but demand is predictable, a *lean* strategy is suitable, e.g. make or source ahead of demand in the most efficient way. Finally, when demand is unpredictable but lead-time short, *agile* solutions will be adopted. To succeed a rapid response in a product ramp-up, cross-functional teams may be used to manage the process. (Christopher et al. 2006)

The ports are essential nodal points in the maritime transport infrastructure. ***Figure 2*** proposes some roles for ports in the earlier discussed supply chain strategies.

Table 1. Some Suggested Roles for Ports in the Context of Different Pipelines (Mangan et al. 2008)

Supply/demand Characteristics	**Resulting Pipeline**	**Roles for Port: Import**	**Roles of Port: Export**
Short lead time + predictable demand	Lean, continuous replenishment	Provision of relatively cheap warehouse space close to point of import for example for vendor managed inventory (VMI): supplier imports freight through the port and replenishes direct to customer from warehouse at the port	If the sea crossing is short, the VMI can also be managed at the export port
Short lead time + unpredictable demand	Agile, quick response	Provision of the warehouse space and cross-docking facilities to allow rapid import, sorting and distribution of varying product lines	Because of the short lead time and unpredictable demand, suppliers may choose to also store goods at the port of export rather than at the originating factory
Long lead time + predictable demand	Lean, planning and execution	Emphasis on cost effective storage capabilities. Also due to long lead time, variation in ships arrival times may arise, berthage space must be available at	Port may provide facility to store export goods, especially if seasonality and variation in ship departure times occur

		the port when needed	
Long lead time + unpredictable demand	Leagile production/logistic postponement	Provision of warehouse/ manufacturing capabilities to allow activities such as postponed manufacturing and pick and pack	Capability to handle/store generic (i.e. non customised) product

The role of ports and particularly container terminals has been recognized vital in the context of supply chain management. As ports are becoming a link in a global distribution channel they need to achieve a higher degree of integration in supply chains to achieve success. Integration in a supply chain adds value to its product and service offerings and can lead to significant improvements in terms of cost reduction, delivery quality and shorter cycle time. (Panayides & Song 2008)

Container terminal supply chain integration can be evaluated by using the following dimensions (Panayides & Song 2008):

- Information and communication systems: Sharing undistorted and up-dated information improves supply chain integration by enabling organizations to improve reliability, dependability and speed.
- Value-added services: It is essential for ports as a part of a logistics chain to provide value added services such as playing the role of distributors or developing continuous replenishment or cross-docking activities. Other value-added activities consist of the ability to launch new tailor-made services for the port users, fulfil specific needs of market segments and to be adaptable to customer needs.
- Physical integration of multimodal systems and operations: Ports are bidirectional logistics systems. They receive goods from ships to be distributed to land (road/rail) and inland waterway modes and vice versa. This requires a high level of co-ordination, inter-connectivity and inter-operability capabilities within the port system.
- Supply chain integration practices: Integration practices can be evaluated by the extent to which the port plans and organizes activities, processes and procedures in the supply chain and monitors performance.

5.2 Transport chain case studies

5.2.1 Transfennica (source: Viacombi)

Transfennica operates a short sea service from Zeebrugge to Bilbao (1400 km), with a transit time of 38 hours only. There are two vessels sailing three times per week. Both of the vessels can take up to 190 trailers and some containers.

The ro-ro service compared to the alternative route by road has several advantages:

- cost reduction of 15 % (estimation of a road haulage company using the service of Transfennica)
- environmentally friendly solution reducing CO2 emissions by 13 %
- fixed departure and transit times
- reliability and punctuality.

Transfennica offers cost efficient and environment friendly transportation solution. As the vessels operate currently three times per week (on Mondays, on Wednesdays and on Fridays) the service suits best for the supply chains with the lean concept where demand is relatively stable and variety is low. Transfennica is planning to double the departures in the future making the solution more interesting for more agile supply chains too.

5.2.2 Volvo logistics cooperation using intermodal transport (source: PROMIT)

Volvo has a distant location to its customers which gives a competitive advantage to its competitors (***Figure 3***). Efficient transport is vital to be competitive and to compensate the peripheral location. The peripheral location affects the company's logistics in two ways. Transport costs are high because distances are long both for sourcing of material and for finished product. There is also little choice in transport alternatives and frequencies are low.

Volvo logistics solutions were already sustainable when starting the activities, but Volvo wanted to optimize costs and reduce environmental impact. In addition Volvo wanted the logistics system to have following features: at least at fast as the existing system, reliable, increasing capacity, potential for future development and possibility to combine product cabs with production material.

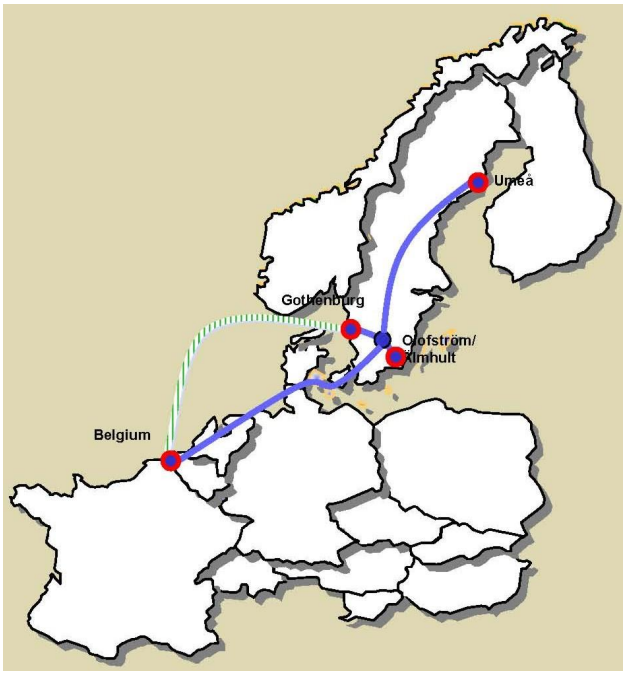

Figure 3. Locations of Volvo Factories in Sweden and the Distribution Centre in Belgium, and the Alternative Transport Routes.

The Volvo Logistics solution for transport between the factories and distribution centres was solved by rail operation called "8" (see ***Figure 4***). The "8" operates two trains per day in both directions Olofström- Gothenburg-Olofström and Olofström/Umeå-Ghent-Olofström/Umeå.

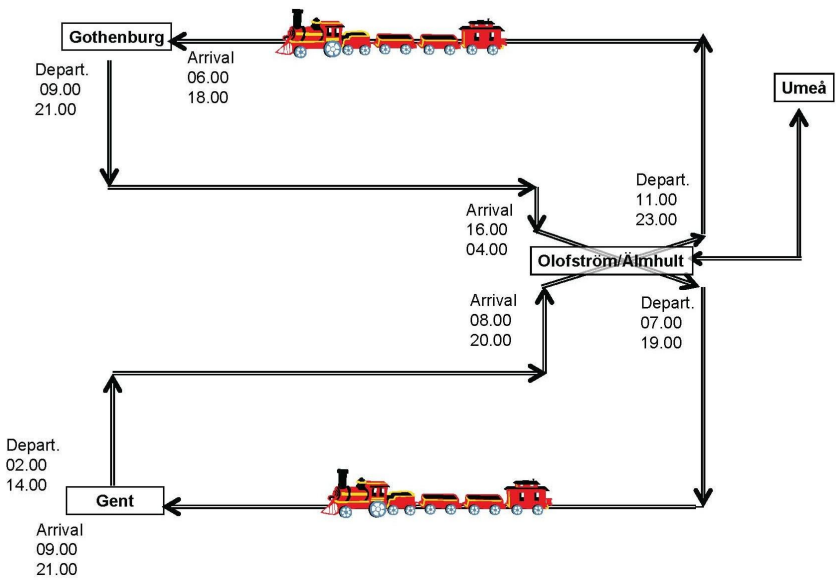

Figure 4. The "8" train.

Volvo Logistics acts as the manager receiving information from factories and distribution centre to make transport decisions. Volvo Logistics co-operates with Green Cargo who has the responsibility to organize transport of cargo from origin to destination. Transport between Gothenburg and Ghent is crucial to Volvo's operations and as a back-up transport solution Volvo Logistics uses short sea shipping by RoRo vessels.

Volvo Logistics made significant efforts related to communication and transparency to have a mutual understanding of efficiency, cost effectiveness and sustainability. In the transport chain there are five countries and languages involved which complicated the situation.

The benefits of the Volvo Logistics transport solution may be summarized as follows:

- The solution is reliable with precision better than 95%
- The solution is quite environmentally friendly compared to road only transport
- The solution is flexible and able to handle fluctuations in volumes (carrying different number of wagons)
- The solution has a significant potential for expansion.

The rail solution with the back-up by SSS gives Volvo a good reliability of deliveries in a supply chain with fluctuating demand.

6. Conclusions

Replenishment lead-times and predictability/variability of demand, in addition to the nature of the product and its lifecycle, are the key dimensions in selecting strategically important logistic concept. Christopher et al. (2006) proposes a matrix of two dimensions - lead time and demand predictability- for selecting global supply chain strategy. These characteristics and sustainability requirements influence remarkably transport solutions. They also pose some role expectations to ports.

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