

TRANSPORT MANAGEMENT TOOLS - THE CASE OF POLISH CHEMICAL SECTOR

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Abstracts

Constant global economic growth and deepening differentiation in customer demand resulting in expectation of supplies customization are stimulating increasing in international trade. In effect transport activities are becoming more intensive on the global scale. At the same time transport management process is supported by different types of tools helping managers to achieve strategic supply chain goals. However, transport operations are rarely indicated as those that add value in the area of its sustainable development. Therefore it is worth to promote such a solutions as multimodal transport that adds value not only in terms of *door-to-door* model but as a sustainable mode. Project ChemMultimodal, as a reply to those challenges, aims to promote multimodal transport by designing special tool for those kind of operations. The part of the first phase of the Project was to diagnose current tools used by companies engaged in the supply chain in chemical sector in Poland. The results show that the most common IS solution are the systems integrated within one company. Respondents evaluated them on quite high level in terms of time savings and data security. However they also underlined limited access to information as one of the main IS disadvantage. Those results confirm the need for in-depth analysis of the possibility of increased use of multimodal transport by supporting firms with the tool that helps planning and decisions making. In effect they can increase competitive advantages and meet environmental requirements by rise of multimodal transport solutions usage.

Keywords: Transport management tools, sustainable transport, multimodal

1. INTRODUCTION

Transport management process is supported by different types of tools helping managers to achieve strategic supply chain goals. As the logistics and supply chain goals are supposed to be in line with company's strategy, the choice of the tool should also be made based on its ability to help company's development and creation of competitive advantages. Increasingly, the search for competitive advantages takes place in areas of sustainable development. However, transport operations are rarely indicated as those that add value to the company in the area of its sustainable development. That is why it is important to study and develop transport management tools that will be able to support the increase use of transport modes that are environmentally friendly. This is also the main objective of ChemMultimodal Project - promotion of multimodal transport of chemical logistics. The project aims to achieve that by coordinating and facilitating cooperation between chemical companies, specialized logistics service providers (LSP), terminal operators and public authorities in chemical regions in Central Europe. The Project is carried out under the Interreg Central Europe Programme between June 2016 and May 2019. The scientific goal of the article is to present part of the effects of the first phase of the Project - the results of research on transport management tools used in supply chain in Polish Chemical Sector. Study was conducted between August and September 2016 by Warsaw School of Economics and Polish Chamber of Chemical Industry.

2. TRANSPORT-INTENSITY AND ITS IMPACT ON FOOTPRINT

2.1. Transport-intensity as part of supply chain performance

Constant global economic growth and deepening differentiation in customer demand resulting in expectation of supplies customization are stimulating increasing in international trade. In effect transport activities are

becoming more intensive on the global scale. Additionally, possibilities of global sourcing have led to products travelling greater distances. Therefore the increase in transport-intensity in supply chain can be noticed [1]. That could be measured in number of kilometers and trips that different SKUs are overcoming on daily basis. Transport-intensity may be a barometer of economic growth, but at the same time it has direct influence on environment and should not be neglected when considering supply chain management activities. Especially if the sustainability and corporate social responsibility concepts are becoming more important in practice than ever before they had been. Therefore improving quality of transport-intensity activities resulting in eco-efficiency is becoming a special issue of global commerce. To improve transport-intensity within supply chain the following steps can be taken [1]: review product design and bill of materials (materials characteristics, possibility to recycling or reuse); review sourcing strategy (especially low-cost country due to the distance); review transport options (choosing eco-friendly transport modes, design vehicles and vessels, etc.); improve transport utilization (empty loading spaces limitation); use postponement strategies (product customization can be finalized near point of use).

Based on the listed possible activities that can be done by supply chain managers, one can assume that direct or indirect influence on carbon footprint exists within supply chain decisions. They can be divided by particular phases of supply chain process as it is described on the **Figure 1**. [1].

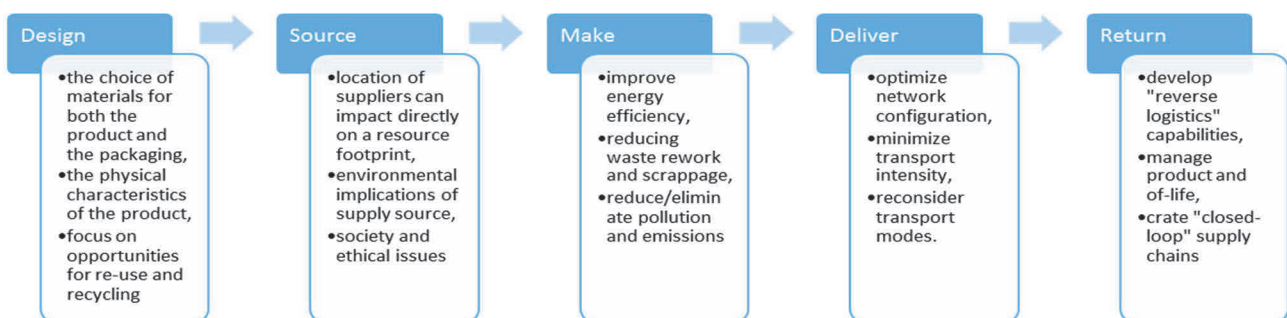


Figure 1 Supply chain decisions impact the resource footprint

The direct impact of transport activities is located in "Deliver" phase of the presented supply chain process. It should be underlined that only part of the possible actions are mentioned and transport management skills have direct and crucial impact on transport-intensity performance. One of them is ability to configure different modes of transport between partners and so increase multimodal solution exploitation.

2.2. Multimodal as a solution helping in improving transport sustainability and supply chain performance

When analyzing transport decision an approach of *door-to-door* is worth to consider. It is the easiest way to have a broad view on distance and its conditions due to the possibility of a diverse selection of transport modes. The availability mode of transport is limited not only by the characteristics of the product, but also the distance and availability of reloading space and capacity. However multimodal solution that is "carriage of goods by two or more modes of transport" is the wider approach to configuration of different modes of transport and transported units described in the literature. Other terminology used to explain combined transport types lists also intermodal transport ("the movement of goods in one and the same loading unit or road vehicle, which uses successively two or more modes of transport without handling the goods themselves in changing modes") or combined transport ("intermodal transport where the major part of the European journey is by rail, inland waterways or sea and any initial and / or final legs carried out by road are as short as possible") [2]. However intermodal and combined transport have some limitations that could exclude their usage by particular supply

chain. Therefore multimodal is revised as the most flexible solution that could be used to improve transport sustainability and influence on supply chain eco-friendly performance. It is due to the possibility to wider include railway or inland modes. At the same time it should be underline that proper management and so the tools used for the transport management are critical for its successful development and multimodal exploitation.

3. TRANSPORT MANAGEMENT AND ITS ICT TOOLS

According to Griffin “management is a set of activates including planning and decision making, organizing, leading and controlling directed at an organization’s resources with the aim to achieving organizational goals in an effective and efficient manner” [3]. Whether managers are trying to boost revenues, innovate, improve quality, increase efficiencies or plan for the future they have searched for tools to help them. However not every tool is a cure-all and there has to be some decision made on what suits best current environmental conditions. The same situation can be observed when considering transport management tools. The most important part of management process in this case is planning and decision making, especially if it comes to the management of multimodal transport. There are some specific circumstances that should be consider when evaluating transport mode. First it is the product characteristics and its cargo transport vulnerability. Than the distance between each party and the nature of primary need for transport should be revised.

When considering global supply chain one can easily observe the complexity in the number of parties, the distance diversity and differentiated goals of particular supply chain members. Therefore, for smooth flows’ of goods, money and information, some conditions should be taken into consideration. These are the following: leader who is able to set the priorities in the net of companies engaged in the supply chain system; strategy that links and combines the activates of individuals and makes them compatible and able to achieve competitive advantages; integration and partnership between companies leading to value chain creation that is “a set of activities that are performed to design, produce, market, deliver and support its product” [4]; tool that provides information on flows and its current capacity in the supply chain.

The above conditions are required to achieve expected level of value and market advantages. Therefore one of the most important aspect - being a base for planning and decision making - is ability to interorganizational coordination of the flows and dependencies. Thus companies are using different tools allowing them for synchronization through shared information rather than series of separate acts realized by each stage of the conventional supply chain model. The most frequently used tools for transport planning within supply chain are based on information and telecommunication technology (ICT). Information systems (IS) can help companies on the different level of their integrality and technology level of advancement. There are several possible ISs’ solutions used by companies for transport planning and coordination, like: separate applications serving to particular tasks within a single company; systems that are integrated within one company; systems that are integrated between company and suppliers and / or customers; systems integrated inside the company with different logistics service providers (LSP) or forwarders; systems served by LSPs, advanced platforms that serve simultaneously many parties.

The last ones can be supported by cloud computing model and rise whole supply chain on a higher level of competitiveness [5]. Transport management tools, especially when considering multimodal solutions, are supposed to find a transport solution that matches a transport requirements. The more criteria evaluating transport possibilities is taken into account the better result of comparison is achieved. There are criteria that are transport-related, e.g. costs, time, environmental effect, physical complexity, administrative complexity, extra service and other criteria that are participant-related: quality, reliability, personal relationship and after-sales service. Thus IS should cover several requirements. They are - multiply transport modes; multiple time aspect and multiply criteria [6]. The proper IS should cover requirements and be able to meet interoperable conditions for its development. Only in this way supply chain can reach sustainability in managing transport.

4. MULTIMODAL TRANSPORT MANAGEMENT TOOLS IN POLISH CHEMICAL SECTOR

4.1. Project ChemMultimodal concept

The main objective of ChemMultimodal Project is a promotion of multimodal transport of chemical goods. The Project aims to achieve this by coordinating and facilitating cooperation between chemical companies, specialized LSP, terminal operators and public authorities in chemical regions in Central Europe. The Project is carried out under the Interreg Central Europe Programme between June 2016 and May 2019.

The first phase of the Project concentrated on diagnose on how physical flows of chemical goods are managed and what kind of tools are used in supply chain to support smooth and continues flows. This information will be a base for a tool development that aims to promote increasing in multimodal transport usage. The first phase of the Project was the research conducted within 49 main market players by Warsaw School of Economics and Polish Chamber of Chemical Industry between August and September 2016. There were two groups of respondents invited to the study - chemical producers and LSPs that cooperate with producers or within chemical supply chain in Poland. Finally, 22 questionnaires were filled in - 13 by chemical producers and 9 by LSPs. In the next section, the main results from the part concerning current tools for transport management usage are presented.

4.2. Transport management tools used in chemical supply chains in Poland

During the first phase of the Project respondents were asked about the type and the capabilities of the IS used as a tool for transport management in the chemical supply chain in Poland. The most popular solution among both groups of respondents was the system integrated within one company - 26% of chemical producers and 19% of LSPs are using this solution. The second most common IS, rated at the same level (16%) by both groups, was system integrated between company and suppliers and / or customers. Detailed results are shown on **Figure 2**. It is worth to mention, that companies still use spreadsheets for transport activates planning and management. Using a platform as a base for information flow is a rarity and cloud computing model is used only occasionally.



Figure 2 Information systems used for transport management in Polish Chemical Sector

Respondents were also asked for their IS evaluation. The highest ratings for IS advantages were assigned to time savings (Chemical producers - 4.4 point and LSPs - 4 points in the scale where 5 was the highest advantage), and data security (Chemical producers - 4.2 point and LSPs - 4.5 point). **Figure 3** presents results of IS advantages evaluation.

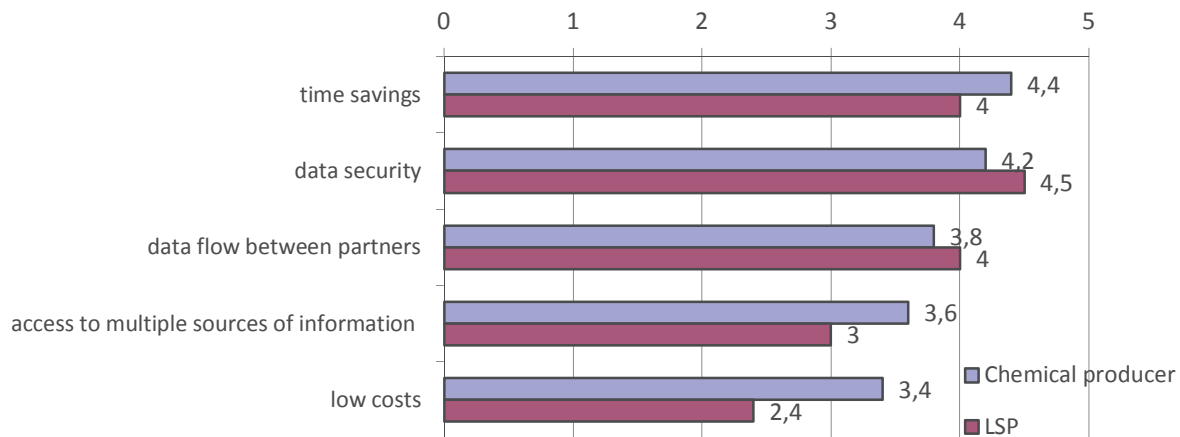


Figure 3 Advantages of information systems used for transport management in Polish Chemical Sector

At the same time both groups of companies were asked to identify the main disadvantages of the IS they are currently using as a tool for transport management. On average, evaluated factors were rated at the similar levels. Chemical producers and LSPs indicated limited access to information and long time access to information as the main disadvantages of the system they are using. Also lack of communication between partners and high costs were mentioned as negative sides of IS. Detail results are shown on **Figure 4**.

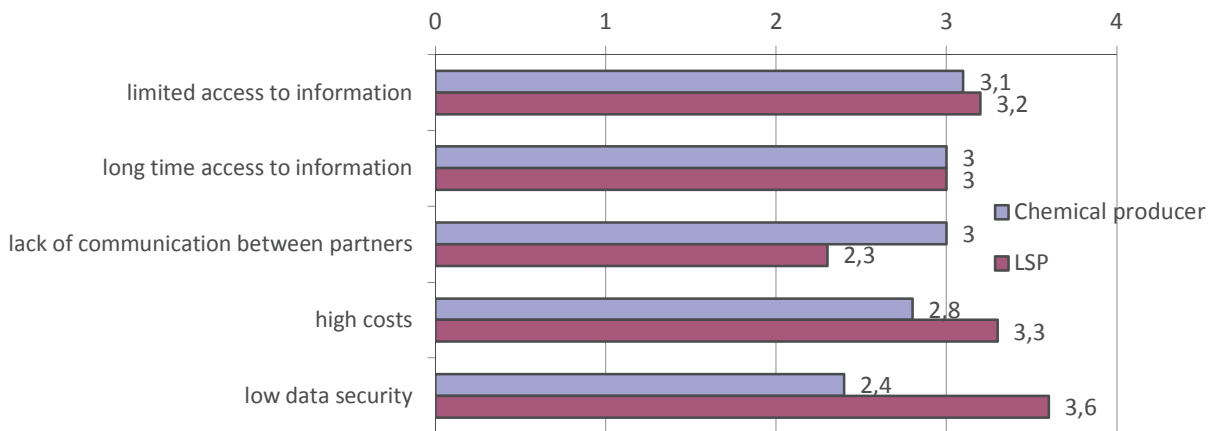


Figure 4 Disadvantages of information systems used for transport management in Polish Chemical Sector

In general companies are satisfied by the IS they are currently using for transport management and they are not particularly interested in their improvements. However it should underline, that whenever companies recognize the need for increased use of multimodal transport in their supply chains than this will require increasing the interoperability of the system used as a tool for transport management and therefore need to be developed.

5. CONCLUSION

The current environment of globalization, rapid technological advances and economic turbulence has increased the challenges for supply chain management. The problem arises when sustainability in transport management is taken into account. At the same time the availability mode of transport is limited not only by the characteristics of the product, but also the distance and availability of reloading space and capacity. When analyzing reconciliation between ability to supply commodity in the *door-to-door* model and sustainable modes

of the transport, the multimodal transport (that includes railway and / or inland modes) can be a good solution. However it is a complex and multi-dimension problem that should be supported by specific management tool. The most common practice is the usage of IS as a transport management tool. However not every IS is suitable for planning, coordination and synchronization many parties and their goals in the supply chain. Thus the concept of ChemMultimodal Project arisen. The main objective of the Project is a promotion of multimodal transport of chemical goods. To fulfill the objective, first there was a need to diagnose what kind of tools are used currently among companies engaged in Polish Chemical Sector supply chain. The part of the first phase of the Project resulted in the information that the most common IS are the systems that are integrated within one company. Respondents evaluated that on quite high level in terms of time savings and data security. However they also underlined limited access to information as one of the main disadvantages of the transport management tool. Those results confirm the need for in-depth analysis of the possibility of increased use of multimodal transport in terms of supporting firms in the specific tool that helps planning and decisions making. Currently available ICT capabilities are able to add value to supply chains due to their interoperability. Those can help companies to increase their competitive advantages and meet environmental requirements by rise of multimodal transport usage.

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