

virtual collaboration; sharing supply chains; communication platforms; load factor; empty runs

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THE CONCEPT OF ORGANIZING TRANSPORT AND LOGISTICS PROCESSES, TAKING INTO ACCOUNT THE ECONOMIC, SOCIAL AND ENVIRONMENTAL ASPECTS

Summary. Current model of organization of supply chains results in inefficient use of transport resources, high transport costs, increasing congestions and CO₂ emission. This effect has been demonstrated by research conducted by the authors as well as by the European Environmental Agency. This situation can be change by development of alternative business model for collaboration in organisation of the transport processes within the supply chains. The aim of this paper is to present practical implementation of the T-Scale platform that enables collaboration between independent transport users and transport service providers. Moreover, an overview of existing communication platform with its major functionalities are presented. The work is summarized by the major benefits of collaboration achieved by the group of companies operating in the FMCG sector in Poland.

KONCEPCJA ORGANIZACJI PROCESÓW TRANSPORTOWO-LOGISTYCZNYCH Z UWZGLĘDNIENIEM ASPEKTÓW EKONOMICZNYCH, SPOŁECZNYCH I ŚRODOWISKOWYCH

Streszczenie. Obecne modele organizacji łańcuchów dostaw wykorzystują zasoby transportowe w sposób nieefektywny, co skutkuje wysokimi kosztami transportu, rosnącą kongestią oraz wzrostem emisji CO₂. Potwierdzają to badania prowadzone przez autorów, a także przez Europejską Agencję Ochrony Środowiska. Opisane w pracy problem mogą być wyeliminowane poprzez wprowadzenie w firmach nowego modelu wspólnej organizacji procesów transportowych w łańcuchach dostaw. Celem tej pracy jest przedstawienie wyników z praktycznego wdrożenia platformy T-Scale, która umożliwia współpracę niezależnych użytkowników transportu i dostawców usług transportowych w oparciu innowacyjny model biznesowy. Dodatkowo w pracy zaprezentowano przegląd istniejących platform komunikacyjnych wraz z ich głównymi funkcjonalnościami. Prace podsumowują wyniki wdrożenia rozwiązania w grupie firm z branży FMCG działającej w Polsce.

1. INTRODUCTION

The European economy has been experiencing some radical changes in the last few years. The analysis of the data of the European Statistical Office shows a 5% increase in the sales and turnover in wholesale and retail trade in European Union states. The effects of the global economic recession

appeared in 2009, causing the slowdown of the economic progress. Still, companies have remained active and have been adjusting their strategies to the changing market conditions [5]. Mergers of companies have taken place, new process management concepts are introduced. At the same time, competition gets stiffer and consumers' expectations grow. It should be also noted that regardless of the economic growth rate, the transportation of goods by road increased in the last four years. As an example, on the basis of the latest data made available by the Main Statistical Office (GUS), the share of road transportation in goods shipping in Poland was 84.4% in tons, and 70.4% in ton-kilometers [3].

These changes forced companies who not only wish to survive, but also to develop and bring the expected profits, to introduce changes to their operation. Hence, it was necessary to search sets of activities, most often completed in sequences, that would allow to make a product or provide a service whose value is specified and acceptable to the customer.

Therefore, the paper's objective is to present an implementation of a model for collaboration in the supply chains that will enable to increase of efficiency and effectiveness of executed processes. The implementation has been carrying out within members of ECR Poland.

ECR Poland, member of ECR Europe - a non-profit association focused on optimising value chains in order to deliver better value for consumers/shoppers. ECR Mission is working together to fulfil consumer/shopper needs – better, faster and at less cost in a sustainable way. ECR Poland gathers large, medium and small companies representing:

- retailers and wholesalers,
- manufacturers (mostly supplying all Europe)
- service providers (including logistics and IT services).

2. UTILISATION OF AVAILABLE TRANSPORT RESOURCES IN EUROPE

The effects of the currently applied approach to transport organization within existing supply chains lead to heavier traffic, reduced travel safety and increased emission of harmful substances. The growing congestion lowers the average technical speed of vehicles, ultimately increasing delivery time and possibly impact on customer dissatisfaction, which may even cause a part of orders to be cancelled. Hence, in the long run the companies unwittingly work towards worse financial results and reduced competitiveness.

The above situation is confirmed by the research of the European Environment Agency. The research shows that the utilization of the available load capacity of transportation means is poor across UE states. In case of the most popular type of transportation, namely road transportation, the average utilization of the available load capacity of trucks for delivery or distribution purposes is at 54% [1]. Naturally, the situation varies among specific countries. For example, for coastal countries an important aspect is the planning of the work of logistics enterprises in ports [9].

These results were confirmed by research conducted by the European Statistical Office and Professor Alan McKinnon of the Heriot-Watt University. According to their analyses the EU average percentage share of empty runs, as a total number of covered kilometers, for road transportation is at 25% [7]. Unfortunately, it often happens that truck owners cannot find return loads and their truck come back empty or only carrying minor loads.

The analysis of presented results leads to a conclusion that transportation resources are used uneconomically, simply speaking are wasted [6]. These activities not only apply to improper use of the available resources, but also confirm that possibilities of completing given actions with reduced outlays are either omitted or intentionally ignored [1].

Taking into consideration presented above information, together with 30 production companies from ECR Poland a detailed measurement was carried out. The aim of this action was to identify what was the load factor (utilisation of the truck space) while cooperation with small and medium transport companies (partial and FTL transports described in previous chapter). The utilization of the available load capacity of trucks for delivery or distribution purposes was at 57% [5].

3. PROS AND CONS OF EXISTING WEB-BASED SOLUTIONS SUPPORTING ORGANIZATION TRANSPORT PROCESSES

Numerous possible cooperation modes within supply chain provoke interest in easy and quick exchange of electronic data among potential transport providers and transport users [11].

The disadvantages of the current approach to the organization of processes within supply chains, as described in the previous chapter, may be eliminated through implementing of new model for collaboration of independent companies, either associated in clusters or functioning in close proximity. The collaboration should apply to common organization of transport processes within supply chains and their proper coordination in order to achieve the effect of synergy [6, 5]. However, collaboration requires secure, reliable and dynamic data exchange.

Dynamic development of the Internet caused development of web-based solutions for communication in the supply chains. However, based on the information from the industry most of them support classical approach to organisation of transports within supply chains. Detailed research of eleven newly developed communications was carried out. Based on the first analysis, seventeen major functionalities were selected that are essential both for model with and without collaboration of independent transport users and transport service providers. Results of this analysis are presented in table 1. All verified platforms are web-based platforms, provides on-line notification about all events within the supply chains, reporting and management of transport orders. Some of the verified platforms are typical transport freight exchanges, whereas others offer more possibilities to its users.

What is important only two of eleven platforms support collaboration in joint organisation of transport processes between independent transport users and transport service providers. These platforms are T-Scale and TRI-VISOR. As T-Scale was created in order to support collaboration it covers sixteen out of seventeen functionalities, which were verified during this analysis. T-Scale only does not support truck loading process. Table two presents summary of the products and their coverage of analysed functionalities.

4. VIRTUAL COLLABORATION IN PRACTICE – T-SCALE PLATFORM CASE STUDY

The idea of developing new business model for joint transport processes organisation within member companies of ECR Poland began in 2010. The whole 2010 was spent on the development of theoretical model and discussion among production companies about ways of possible cooperation. Based on steps which allows implementation of the solution were carried out:

- cost and value analyses for transport users, as well as service providers,
- development of practical web-accessible tool (T-Scale) enabling automated information exchange between involved parties within the whole supply chain in order to start vertical cooperation between companies to reduce transport cost,
- guidelines on information sharing based on the unified communication standards,
- some possible pre-defined scenarios, based on:
 - product categories,
 - current distribution network set-up,
 - geographies,
 - scale economies,
- guidelines on ordering processes optimisation within the supply chains,
- other changes in transport processes organisation to present operations that are envisaged,
- key performance indicators.

Developed T-Scale platform plays the crucial part in the virtual collaboration in transport organisation within the supply chains. T-Scale allows real time exchange of information among companies participating in the realization of transportation processes. It enables to form temporary cooperation network (virtual supply chains). There are four key roles applied:

Table 1

Summary of the platforms supporting analysed functionalities

No.	Functionality	Number of products supporting analysed functionality	% share of products supporting analysed functionality
1.	Web-based communication platform	11	100,0%
2.	On-line notification	11	100,0%
3.	Reporting	11	100,0%
4.	Transport orders management at company level	11	100,0%
5.	Monitoring of the performed task	10	90,9%
6.	Digital map	10	90,9%
7.	Route optimisation	10	90,9%
8.	Invoicing	10	90,9%
9.	Fleet management	8	72,7%
10.	Freight exchange	6	54,5%
11.	Real-time monitoring of the performed tasks	5	45,5%
12.	Transport orders management at group of independent companies level	4	36,4%
13.	Verification of business partners	4	36,4%
14.	Coordination of transport orders and transport resources from independent companies	2	18,2%
15.	Optimisation of truck loading process	1	9,1%
16.	Share of savings among group of cooperating companies	1	9,1%
17.	Support of existing communication standards	1	9,1%

- The transport users define transportation needs.
- The transport service providers offer their services.
- The planning of deliveries and generating of consolidated transportation orders are made by the transportation coordinator, who also acts as an intermediary between group of independent producers and carriers.
- 4th party role responsible for auditing of all companies, verifying if the agreed conditions for cooperation are obeyed and providing technical solutions. The Institute of Logistics and Warehousing acts as technical and content-wise coordinator. The Institute oversees the technical aspect of operation of the platform. Moreover, ILiM carries out monthly impartial audits of effectiveness of planning of transportation and ensures stability and safety of the solution.

The principal advantage of the discussed solution (T-Scale platform) is the complete coordination of cooperation among different companies involved in the common transport planning and scheduling process in order to use the available transportation resources in a balanced manner. Furthermore, T-Scale is based on agreed global communication standards.

Table 2

Summary of the functionalities supported by the analyzed communication platforms

No.	Product	Producer	Number of functionalities supported by analysed products	% share of functionalities supported by analysed products
1.	T-Scale	ILiM	16	94,1%
2.	TRI - VIZOR	WaterFront Research Park	12	70,6%
3.	TRANSPOREON	TRANSPOREON GmbH	12	70,6%
4.	LOG INTEGRA	Vesper Software	11	64,7%
5.	TIMOCOM	TimoCom Soft- und Hardware GmbH	11	64,7%
6.	Wtransnet	Wtransnet	11	64,7%
7.	InterLan	InterLan	10	58,8%
8.	Sky Logic	Benson Consultans	10	58,8%
9.	ORTEC	ORTEC	10	58,8%
10.	RAMCO	RAMCO	9	52,9%
11.	Pooling France	DIAGMA, ECR France, IPS Europe	5	29,4%

The following transport communication standards (GS1 standards for transport and logistics) were selected and agreed to be used in the new business model for joint transport processes organisation:

- Global Location Number (GLN) - is the GS1 ID Key used to identify locations and legal entities. Using a GLN rather than a proprietary internal numbering system for locations gives a company significant advantages, because it provides a standardised way to uniquely identify entities and locations throughout the supply chain [4].
- Serial Shipping Container Code (SSCC) - the GS1 ID Key used to identify individual logistic units. A logistic unit is defined in T-Scale as combination of units put together on a truck/container, where the specific unit load needs to be managed through the supply chain [4].
- format for naming point of origin and destination,
- type of products groups and its transport susceptibility,
- type of transport units and its equipment,
- transport request,
- transport order,
- transport service description [8],
- format of the transport pricelists,
- common process for placing of the transport requests and orders,
- common process for sharing of the savings in the transport costs.

The T-Scale platform improves communication between virtual supply chain participants for purposes of joint organization of deliveries, which translates to a number of benefits from the cooperation between companies, such as:

- optimization of transportation costs due to the achieved scale effect,
- improved availability of cargo space,

- better utilization of the load capacity of trucks,
- elimination of "empty runs",
- reduction of road traffic intensity.

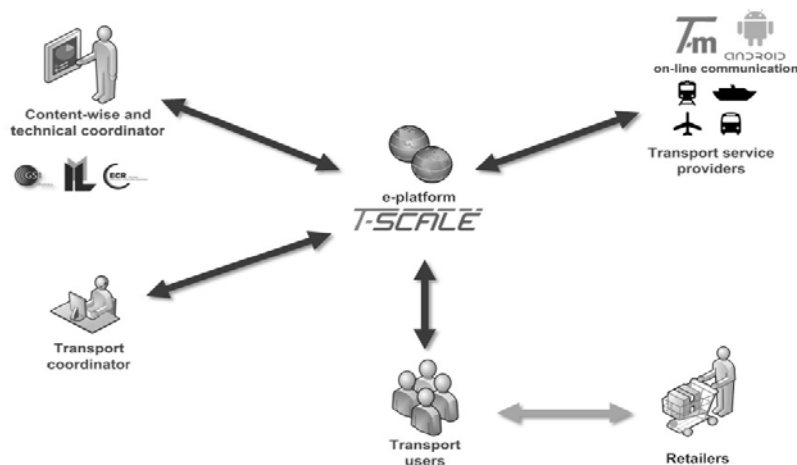


Fig. 1. Roles on the T-Scale platform

Rys. 1. Idea współdzielenia łańcuchów dostaw w praktyce

On the selected seventeen routes, which belong to ten producers, T-Scale in June 2012, was able to significantly improve effectiveness and efficiency of the transport processes. At the beginning of the pilot implementation the following options for collaboration were defined:

- First option: Cooperation within FTL transports in order to find partner, which allows two or more producers to close the whole route (e.g. from point A to point B and from point B to point A). Therefore, total transport rate is going to be calculated on the basis of the number of run kilometres. It means production company is paying for transporting the route from point A to point B and from B to A.
- Second option: Cooperation within joint organisation of partial transports (above 10 pallets) and LTL in order to increase utilisation of truck and reduction of transport unit costs.

Table 3

Results of the T-Scale operations in June 2012

Parameter	Without T-Scale and communication standards	With T-Scale and communication standards
Pallets carried out [pcs]	18202	18202
Total number of transport routes [pcs]	821	649
Total number of kilometres [km]	198682	157058
Total transport costs [euro]	168880	119757
Total savings in transport costs [euro]	-	49123
Average savings in transport costs per company [%]	-	15%
Average share of empty runs in total number of kilometres [%]	data not available	7,7%

To sum up, sharing of resources and cooperation in transport organisation according to agreed communication standards is of multi-dimensional nature. It positively impacts both companies that use transport services and the ones that provide such services. However, it is still a challenge to change companies attitude and approach with respect to the business processes organisation and being more

open for cooperation in the field of logistics. Moreover, presented case concerns only road transport cooperation, there is a great challenge to implement similar business model for intermodal transport, where more actors are involved in the process.

5. CONCLUSIONS

The intensive development of Business Intelligence and Competitive Intelligence tools, access to information from multi-dimensional data analysis [10] aggregated from various enterprise IT systems sources (usually in case of heterogeneous environments) has been significantly facilitated in recent years. However, vast majority of available tools supports only classical approach to organisation of transport processes within supply chains. To improve effectiveness and efficiency of transport processes a new approach is a must in the near future [2]. Companies need to collaborate based on the agreed data standards within secure and reliable virtual supply chains.

Virtual collaboration allows sharing of resources and joint cooperation of transports, which is of multi-dimensional nature. It positively impacts both companies that use transport services and the ones that provide such services. Furthermore, these companies are closely connected to the environment in which they operate. In many cases the main objectives of companies and the society are not identical. The proposed solution makes it possible to organize logistics process while taking into account economic, social and environmental aspects.

Additionally, the positive reception of the solution by the leading manufacturers and distributors in Poland allows to hope that the solution will soon be accepted and employed in business activity.

This hope is also fortified with the growing awareness the companies have of their impact on the environment. It can now be observed that companies exhibiting advanced social awareness often shape their activities not only with their own strategies in mind, but also taking into account the objectives and values of the society. Corporate social responsibility is a method of creating generally understood benefits, both for companies, as profits, and for its environment. Hence, it can be said that a company following the principle of sustainable development can achieve a balance between its profitability and effectiveness, and social interests.

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