



INNOVATIVE APPROACH TO COLLABORATION IN JOINT ORGANIZATION OF TRANSPORT PROCESSES

Marcin Hajdul, Piotr Nowak

The Institute of Logistics and Warehousing, Poznan, Poland

ABSTRACT. Background: The paper presents an innovative approach to the collaboration in joint transport processes within existing supply chains which has been implemented by member companies of ECR Poland. Current approach results in inefficient use of resources due to mainly horizontal cooperation between individual service users and service providers. This effect has been demonstrated by research conducted by the author as well as by the European Environmental Agency.

Methods: The aim of this paper is to present how design thinking approach allows creation of new transport business model and communication platform.

Results: Created solution allowing simultaneous vertical and horizontal co-operation of independent companies involved in the organization of transport processes. The result of such cooperation is the elimination of identified inefficiencies through sustainable use of available resources.

Conclusions: The work is summarized by the results of the implementation of presented solutions within the group of companies operating in the FMCG sector in Poland. Companies were able to reduce their transport costs, increase load factor, reduce empty runs as well as reduce congestion on roads where they operate.

Key words: design thinking, innovation, virtual collaboration, sharing supply chains, communication platforms, load factor, empty runs.

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 [Golinska, Hajdul 2012]. 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 [Śliwaczyński, Hajdul, Golińska 2012]. Mergers of companies take 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, [McKinnon 2010].

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 making a product or providing a service

whose value is specified and acceptable to the customer.

What is more, due to the economic crisis and dynamic changes on the business market most of the producers work on the reduce to the minimum margin. Their aim is to be competitive and offer as good price of their products as it is possible. However, the price of the finished product offered by manufacturing or distribution companies depends on the level of incurred fixed and variable costs. It is even more important to rationalize the cost of logistics, with special emphasis on the cost of flow of goods, since this will allow offering end customers a lower price for the final product, and thus contributing to the competitiveness of enterprise.

Based on the overview presented above, it is clear that new approach to organisation of transport processes is one of the key elements to which more and more companies started to pay attention and try to optimize it to increase their competitiveness.

Therefore, the paper's objective is to present a how design thinking approach to innovation allows creation and implementation of new business model for collaboration in transport. 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).

CURRENT WAY OF TRANSPORT PROCESSES ORGANIZATION

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 impacting 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 [Golinska, Hajdul 2011].

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% [European Environmental Agency 2010]. Naturally, the situation varies among specific countries.

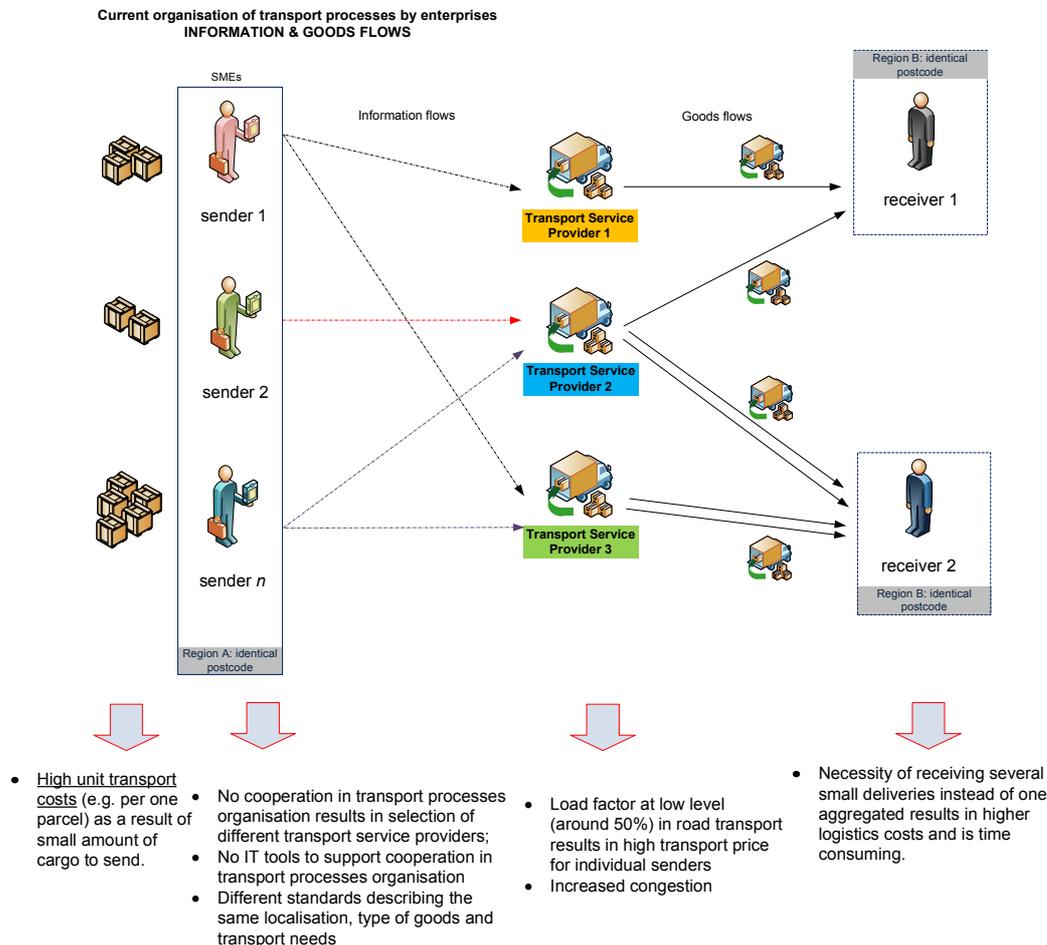
This results were confirmed by research conducted by the European Statistical Office and Professor Alan McKinnon of the Heriot-Watt University. According to their analyses the EU average percentage share of empty runs, as a total number of covered kilometers, for road transportation is at 25% [McKinnon 2010]. 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 [Hajdul 2010]. 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 [Hajdul, Golińska 2012].

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% [Hajdul, Golińska 2012].



Source: Own study

Fig. 1. Selected weaknesses of traditional way of organizing transport process by selected members of ECR Poland
 Rys. 1. Wybrane słabe strony tradycyjnego podejścia do organizacji przewozów w firmach należących do ECR Polska

DESIGN THINKING APPROACH TO INNOVATION

There are a variety of ways to define the main goals of each company. While it is true the firm is generally dedicated to maximising the investment return on the cash and other assets contributed to the enterprise, it is perhaps more useful to develop a definition of the output from the firm's business activities that is more closely aligned to the actual uses of the firm's resources. A term that has become

quite popular in last years is innovation, which has been defined as the search for, and the discovery, development, improvement, adoption and commercialisation of, new processes, new products, and new organisational structures and procedures. The search for innovation is very complex and costly, and involves a good deal of uncertainty, risk taking, ideation, designing and redesigning, experimenting and testing [Bigliardi, Dormio 2009].

On the other hand competitiveness at the company level depends crucially on the speed with which new products can be brought to the

market place and new cost saving innovations can be made. Similarly, the creation of wealth and employment depends to a very large extent on the speed with which scientific and technological breakthroughs are converted into practical and attractive solution. Innovation - the ability to reap the rewards of scientific achievement - requires much more than the ability to turn a new idea into a working product.

Efficient flows of technology are not enough - ready supplies of finance and of business skills are also needed. There must be accessible protection for intellectual property, and adequate incentives for entrepreneurial drive. In short, what is needed is a dynamic, self-sustaining culture of innovation. Thanks to a culture of innovation the small and medium-sized enterprises (SMEs) have proved themselves to be the engines of economic growth, and the principle sources of new employment and in many fields provide the channels along which new technologies develop. As a consequence, the economic growth widely relies on the existence of SMEs that innovate themselves and are also ready to cooperate with each other. Innovation is increasingly likely to come from outside of the individual firm or even from another institutional sphere such as the university where the focus of attention is on original path breaking developments, whether in science or technology. Moreover, it can be expected that discontinuous innovations, which originate in a company, are more likely to be utilized in a different environment where the blinders of current taken for granted practices or commitment to existing technologies and products are less likely to have effect. As innovation moves outside of a single organization, lateral relationships across boundaries, rather than hierarchical bureaucratic structures, become more important. To both analyse these developments and guide their future development, a new model of the cooperation among companies in organization of their processes is needed [Rothwell, Zegveld 1983].

In order to be precise term innovation should be precisely defined. On the one hand we have the most popular European approach defined in so called Oslo Manual and on the

other hand we can describe innovation through the concept of design thinking.

According to the Oslo Manual innovation can be new technology, product, process and new or improved way of organization. The term - product is used to cover both goods and services. Innovation can be understood not only as new product or process but also as significant technological improvement of product or process. Novelty for innovation in that meaning is that it is new at least for the company. Power of innovation can be measured by degree of this novelty, so it can be new for company, branch, whole region or country or in the best case new in the world. Moreover - when we are considering organizational change in can be treated as innovation (according to Oslo Manual) if there is measurable change in output (such as for example increased productivity). Innovation requires improvement in performance of the service or in the way in which it is delivered. Such improvement is measured by costs savings of companies reorganizing transport processes by using tool designed by Institute of Logistics and Warehousing [Eurostat 2005].



Source: own study

Fig. 2. Design thinking approach to innovation
Rys. 2. Zastosowanie myślenia projektowego w tworzeniu innowacji

In design thinking methodology, which were used in project of reorganization of transport processes, three main components build real and valuable innovation. These three elements are: business viability, technological feasibility and human values [Plattner, Meinel, Leifer 2011]. This approach is presented on Figure 2.

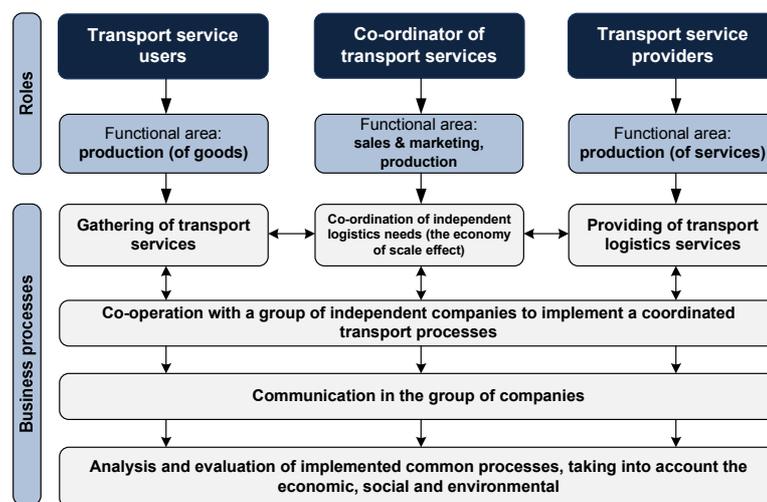
All three above mentioned components of the innovation understood according to design

thinking methodology are very well represented in the project of reorganization of transport processes. The first element - business viability was verified in the series of pilot cases performed with testing companies at the very early stage of implementation. Optimization of transport processes leads to significant savings for companies and as the result financial benefits become crucial advantage for each involved business entity. The second element - technological feasibility is assured thanks to well design software allowing group of companies for common reorganization of their transport processes. And last but not least - the third element - human values - behind each piece of software are always people operating it and making their decisions. Involvement of this end users in whole processes of creation of the solution and through testing and redesign of its functionality led to the innovation which well fit needs of companies and employed there specialists working in reorganization and optimization of transport processes.

PRACTICAL IMPLEMENTATION OF THE COLLABORATION MODEL IN MEMBERS OF ECR POLSKA

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 way of possible cooperation.

The created by the Institute of Logistics and Warehousing reference model for the coordination of transport processes in companies defines the roles of individual links, dependences between such links and also between the companies and the region where they operate. Fig. 11 presents the developed reference model.



Source: Hajdul Golińska 2012

Fig. 3. Reference model allowing collaboration in joint organization of transports

Rys. 3. Model referencyjny umożliwiający współpracę w organizacji procesów transportowych

In the developed reference model, the companies cooperate for the purpose of completion of defined business processes. These processes are completed in specified functional areas present in each company. The cooperation between individual firms in the model is both vertical and horizontal. In practice this means that first, vertical

cooperation takes place within objects fulfilling the same role in the model.

Based on that steps which allow 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:

- 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.

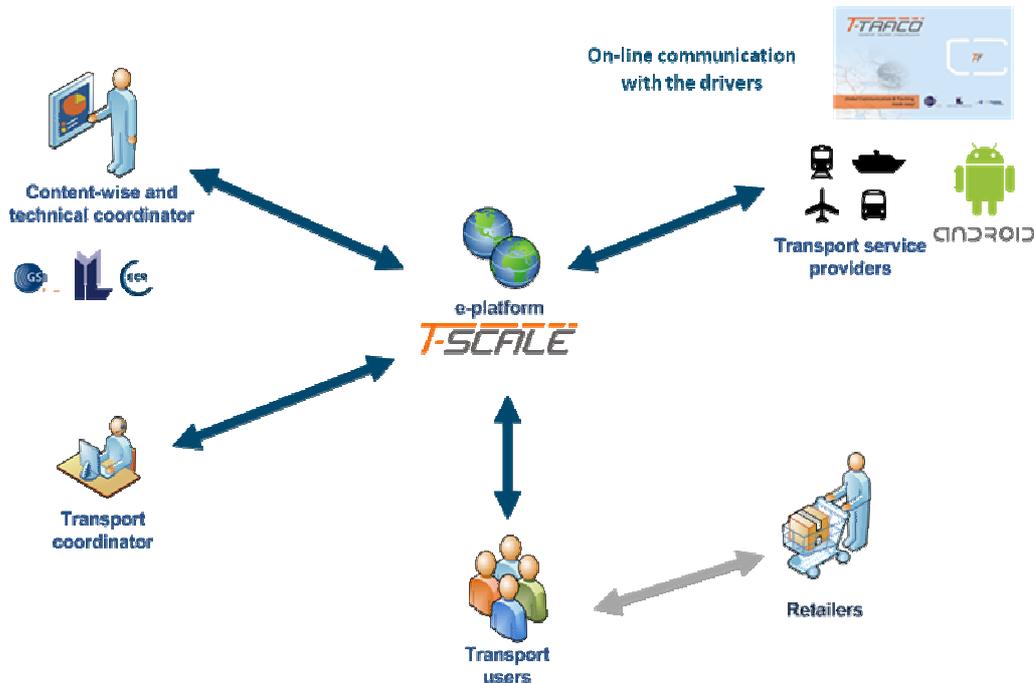
The following transport communication standards (GS1 standards for transport and logistics) were selected and agreed to be used in the new business model for joint transport processes organisation:

- 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 [GS1 2010].
- 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 [GS1 2010].
- 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 [Pedersen, Paganelli, Knoors 2010],
- 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.



Source: own study

Fig. 4. Roles on the T-Scale platform
 Rys. 4. Role na platformie T-Scale

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.

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.

Table 1. Results of the T-Scale operations in June 2012
 Tabela 1. Rezultaty współpracy na platformie T-Scale z czerwca 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%

CONCLUSIONS

Collaboration in joint cooperation of transports is of multi-dimensional nature. It 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, one can say that a company following the principle of sustainable development can achieve a balance between its

profitability and effectiveness, and social interests.

REFERENCES

- Bigliardi B, A.I. Dormio, 2009, An empirical investigation of innovation determinants in food machinery enterprises, *European Journal of Innovation Management*, 12, 2.
- European Commission, 2005, *Oslo Manual. Proposed guidelines for collecting and interpreting technological innovation data*, 3rd edition, OECD - Eurostat.
- European Environmental Agency, 2012, *Road freight load factors (during the laden trips)* [online]. Available at: www.eea.europa.eu/data-and-maps/figures/road-freight-load-factors-during [access: 14.09.2012].
- Golinska P., Hajdul M. 2011, *Multi-agent Coordination Mechanism of Virtual Supply Chain*. KES-AMSTA 2011, 620-629.
- Golinska P., Hajdul M. 2012, *European Union Policy for sustainable transport system - challenges and limitations*, [in:] *Sustainable transport* Golinska P., Hajdul M. (eds.), Springer Verlag, Berlin Heidelberg, 3-20.
- GS1, 2010, *GS1 standards in transport and logistics*, GS1 Global Office, Brussels.
- Hajdul M., 2010, *Model of coordination of transport processes according to the concept of sustainable development*, *LogForum*, 3, 21, 45-55.

Hajdul M., Golinska P., 2012, Virtual logistics clusters - IT support for integration, Lecture Notes in Computer Science, 7196, Springer-Verlag, 449-458.

McKinnon A., 2010. European Freight Transport Statistics: Limitations, Misinterpretations and Aspirations, Report prepared for the 15th ACEA Scientific Advisory Group Meeting. Edinburgh: Heriot-Watt University.

Pedersen T. J., Paganelli P., Knoors F., 2010, One Common Framework for Information and Communication Systems in Transport and Logistics, DiSCwise project deliverable, Brussels.

Plattner H., Meinel Ch., Leifer L., 2011, Design thinking: Understand - Improve - Apply, Berlin Heidelberg, Springer Verlag.

Rothwell R., Zegveld W., 1983, Innovation And The Small And Medium Sized Firm : Their Role In Employment And In Economic Change, London, F. Pinter.

Śliwczynski B., Hajdul M., Golińska P., 2012, Standards for transport data exchange in the supply chain - pilot studies. Lecture Notes in Computer Science, 7327, Springer-Verlag, 586-595.

INNOWACYJNE PODEJŚCIE DO WSPÓŁPRACY FIRM WE WSPÓLNEJ ORGANIZACJI PROCESÓW TRANSPORTOWYCH

STRESZCZENIE. Wstęp: Artykuł prezentuje innowacyjne podejście do współpracy niezależnych firm produkcyjnych we wspólnej organizacji procesów transportowych w istniejących łańcuchów dostaw. Praca prezentuje rezultaty osiągnięte przez firmy produkcyjne należące do ECR Polska. Przesłanką do podjęcia współpracy pomiędzy firmami była potrzeba poszukiwania nowych modeli organizacji procesów transportowych celem poprawy ich skuteczności i efektywności. Aktualne podejście do organizacji przewozów charakteryzuje się nieefektywnym wykorzystaniem zasobów. Wynika to głównie z faktu współpracy poziomek między poszczególnych usługodawcami i usługobiorcami. Potwierdziły to nadania potwierdzone przez autorów, a także przez Europejską Agencję Ochrony Środowiska.

Metody: Celem pracy jest przedstawienie sposobu wykorzystania metody "design thinking" do stworzenia nowego modelu współpracy niezależnych firm z wykorzystaniem innowacyjnej platformy komunikacyjnej.

Wyniki: Stworzone, w ramach przeprowadzonych przez autorów prac badawczych, rozwiązanie umożliwia jednoczesną pionową i poziomą współpracę niezależnych firm zlecających usługi transportowe jak i firm zajmujących się organizacją procesów transportowych. Efektem tej współpracy jest wyeliminowanie zidentyfikowanych wad istniejących rozwiązań poprzez zrównoważone wykorzystanie dostępnych zasobów.

Wnioski: W podsumowaniu autorzy prezentują wyniki pilotażowego wdrożenia opisanego rozwiązania przez firmy w sektorze FMCG w Polsce. Firmy były w stanie zredukować koszty transportu, zwiększyć współczynnik wykorzystania pojazdów, zredukować puste przebiegi, a także zredukować kongestję w regionie, w którym prowadzą działalność.

Słowa kluczowe: design thinking, innowacja, wirtualna współpraca, współdzielenie łańcuchów dostaw, platformy komunikacyjne, współczynnik wypełnienia pojazdu, puste przebiegi.

INNOVATIVES HERANGEHEN AN DIE ZUSAMMENARBEIT DER FIRMEN INNERHALB DER GEMEINSAMEN ORGANISATION VON TRANSPORTPROZESSEN

ZUSAMMENFASSUNG. Einleitung: Der Artikel präsentiert ein innovatives Herangehen an die Kooperation von unabhängigen Produktionsfirmen bei der gemeinsamen Organisation von Transportprozessen innerhalb der bestehenden Lieferketten. Die Arbeit stellt die Ergebnisse der der Organisation ECR Polska angehörenden Produktionsfirmen dar. Der Ansporn zur Aufnahme der Zusammenarbeit zwischen den betreffenden Firmen ergab sich aus dem Bedürfnis, neue Modelle für die Organisation von Transportprozessen zwecks der Verbesserung deren Wirksamkeit und Effektivität zu finden. Das gegenwärtige Herangehen an die Lösung der Problemstellungen bei der Organisation von Beförderungsprozessen charakterisiert sich durch eine uneffektive Inanspruchnahme von Beständen. Dies resultiert hauptsächlich aus der Tatsache einer horizontalen (waagrechten) Kooperation zwischen den einzelnen Dienstleistern und Dienstleistungsnehmern, was die von den Autoren und der Europäischen Agentur für Umweltschutz durchgeführten Forschungen bestätigt haben.

Methoden: Das Ziel der Arbeit ist es, die Art und Weise der Inanspruchnahme der Methode "design thinking" für die Schöpfung eines neuen Modells für die Kooperation der unabhängigen Firmen mit Anwendung einer innovativen Kommunikationsplattform darzustellen.

Ergebnisse: Die im Rahmen der von den Autoren durchgeführten Forschungsarbeiten ausgearbeitete Lösung ermöglicht gleichzeitige, vertikale und horizontale Zusammenarbeit zwischen den betreffenden unabhängigen Firmen, die die Transport-Dienstleistungen in Auftrag geben oder die Organisation von Transportprozessen in Auftrag nehmen. Das Resultat solch einer Kooperation ist die Eliminierung der ermittelten Nachteile innerhalb der bestehenden Lösungen durch eine ausgewogene Inanspruchnahme von den zur Verfügung stehenden Beständen.

Fazit: In der Abrundung des Beitrags präsentieren die Autoren die Ergebnisse einer einleitenden Einführung der beschriebenen Lösung in ausgewählten polnischen Unternehmen aus dem FMCG-Sektor. Die besagten Firmen waren gegebenenfalls imstande, die Transportkosten zu reduzieren, den Koeffizient der Inanspruchnahme von Transportfahrzeugen zu erhöhen, Leerfahrten zu reduzieren, sowie den lokalen Verkehr in der Region der Ausübung deren Transport-Aktivitäten zu vermindern.

Codewörter: design thinking, Innovation, virtuelle Kooperation, gegenseitige Teilung von Lieferketten, Kommunikationsplattformen, Koeffizient der Auffüllung des Fahrzeugs, Leerfahrten

Marcin Hajdul
The Institute of Logistics and Warehousing
Estkowskiego 6
61-755 Poznań
e-mail: Marcin.Hajdul@ilim.poznan.pl