Uniwersytet Ekonomiczny w Katowicach

Studia Ekonomiczne. Zeszyty Naukowe
Uniwersytetu Ekonomicznego w Katowicach
ISSN 2083-8611 Nr 383 · 2019

Zarządzanie 19

Jagienka Rześny-Cieplińska

WSB University in Gdańsk
Faculty of Finance and Management
Department of Economics
jrzesny@wsb.gda.pl

CROWD LOGISTICS – CONCEPT AND APPLICATION POSSIBILITIES IN POLISH CITIES

Summary: The article presents organizational concepts of crowd logistics solutions aimed at streamlining and optimizing the processes of passenger and cargo flows in urban areas. The analysis will cover the possibilities of adapting the crowd logistics solutions, the types of solutions, as well as the benefits resulting from their implementation, both for residents, entrepreneurs, tourists, and authorities. The author will review the experiences and solutions of the crowd logistics used in the world's metropolises, and on this basis will determine which are likely to adapt in Polish cities. The main goal of the article is to analyse the possibilities of adapting the concept of crowd logistics in Polish conditions as a solution to improve city functioning and to identify barriers of implementing such solutions in Poland.

Keywords: crowd logistics, city logistics, sharing economy.

JEL Classification: L91, R40, R52.

Introduction

In 2008 more people lived in cities than in rural areas. The United Nations Organization predicts that by 2050, nearly two-thirds of the world's projected 9,7 billion population will have been living in urban areas. Urban areas that are characterized by such features as: high level of development of the services sector and innovative potential or development of the IT sector, are gradually evolving towards major metropolitan areas that arise and develop as a result of complex relations between economic organizations (Table 1). These facts influence transformations in the ways of managing such areas and the necessity of systemic changes in the transport services of passengers and cargoes carried out in metropolitan areas.

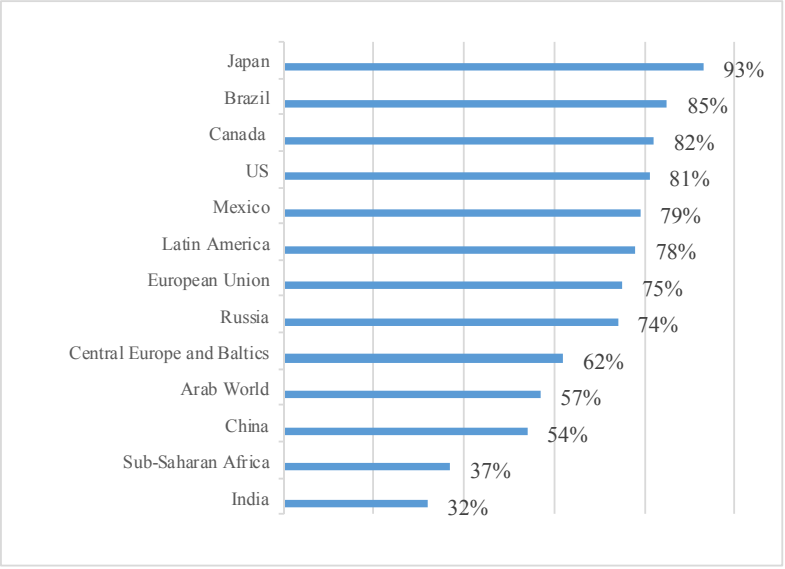
Table 1. World's population by size class of settlements, 2016 and 2030

	2016			2030		
	Number of settlements	Population (millions)	Percentage of world population	Number of settlements	Population (millions)	Percentage of world population
URBAN	–	4 034	54.5	–	5 058	60.0
10 million or more	31	500	6.8	41	730	8.7
5 to 10 million	45	308	4.2	63	434	5.2
1 to 5 million	436	861	11.6	558	1 128	13.4
500 000 to 1 million	551	380	5.1	731	509	6.0
Fewer than 500 000	–	1 198	26.8	–	2 257	26.8
RURAL	–	3 371	45.5	–	3 367	40.0

Źródło: United Nations [2016a, p. 3].

Because of demographic conditions and the high rate of urbanization all over the world, the importance of processes taking place within city areas is still growing, making city management more and more complicated.

Figure 1. The percentages of countries and regions living in urban areas, 2015



Source: United Nations [2016b, p. 33].

The development of urbanization and increase in the number of people living in cities cause the growing problems in passengers and freight transport within the urban areas. Transportation resulting in traffic congestions and the increased levels of air pollution have considerably worsen the quality of living conditions in cities. At present, 67% of passenger transport has been taking place in urban areas, by 2050, the number of kilometres travelled in urban areas will have been tripled. The same trends can be observed in freight transport. In response to these problems, a number of European initiatives in the area of city logistics were introduced. The problem is, the majority of them, focuses on freight transport and internal effects related to its activity. The lack of holistic view on city logistics problems regarding related to the flows of people as well as goods is observed. Thus, it is really important to highlight the coordination of transport flows of passengers and freight. Integration and synchronization of transport in urban areas are the questions of interest in the field of urban logistics, which comes as a tool for solving problems related to the management of highly urbanized areas.

1. City logistics essentials

Caring for the flows of goods and passengers through integrated urban logistics strategies should be a determinant of urban management. Urban logistics is a specific area where smart solutions are often used. Benefits in this regard are felt both by residents, entrepreneurs, administrators, and tourists. As a result of streamlining urban flows, improved traffic flow, increased mobility, and increased quality of life in the city can be observed. Furthermore, the reduction of air pollution, the reduction of noise, the shortening of travel time, the improvement of road safety and the reduction of road infrastructure degradation are of great importance.

It is difficult to find a common definition of city logistics in expert literature [Hajduk, 2017]. Various terms are used to refer to the general concept of transportation of goods, people, and waste in urban areas: “urban goods movement”, “urban logistics”, “urban freight transport” or “urban passengers transport”. The exact definitions of these terms differ slightly as to what is and what is not included [Szołtysek, 2014]. The main creator of this concept, identifies urban logistics mainly with the coordination of the flow of goods within the city. But nowadays, it is more and more common to find the definitions of city logistics referring to flows of goods as well as people within the city areas. Thus, city lo-

gistics may be also defined by aims, being identified as [Taniguchi, Thompson (eds.), 2015]:
- improving quality of life,
- improving the flows of people and goods,
- protecting the environment.

A simple definition of urban logistics states that it is planning, implementation, and monitoring of economic efficiency and effectiveness of people, cargo and relevant information flows in urban areas in order to improve the quality of citizens' life. The most precise definition says, city logistics is the process for total optimization of logistics and transport activities by private companies with the support of advanced information systems in urban areas considering traffic environment, traffic congestion, traffic safety and energy savings within the framework of market economy [Kiba-Janiak, 2016].

2. City logistics practical solutions

The system of urban logistics should be understood as a deliberately organized set of elements, such as [Gatta, Marcucci, Le Pira, 2017]: stakeholders, infrastructure, regulatory standards, tariffs, and relationships between them, which are involved in the process pertaining to the flows of people, cargo and relevant information in urban areas. Providers of urban logistics services are expected to be one of the most important elements of the whole system, and they should offer high quality and reasonable prices of their delivery services in the environment of congested urban areas [Taylor, 2005]. Practical solutions applied in the European countries as regards the improvement in city logistics may relate to the following areas [Civitas Wiki, 2015]:
- land use planning,
- infrastructure,
- market-based solutions,
- new technologies.

Within the scope of land use planning measures, different practical solutions can be distinguished. Most of them are applied in European countries. They can refer to [Civitas Wiki, 2015]:
- restricted access to certain areas, based on different criteria for vehicles,
- exclusivity zones – it consists on limiting of number of transporters that can perform deliveries,

- time slots – solution refers to situation when certain vehicles can enter certain streets,
- nearby delivery areas,
- adapting on-street loading zones.

A more proactive approach is to incorporate freight planning into proper management and to create infrastructure by identifying areas of conflicts between freight activities and other land uses. The initiatives that are needed for proper infrastructure are as follows [Ehmke, 2012]:

- urban distribution centres – collecting shipments in a specialized warehouse at the edge of the city where they are consolidated before last mile transport,
- dedicated parking spaces for trucks – preparing special lanes for loading and unloading trucks or letting them to use bus lanes during certain times of the day,
- direct injection – solution within bringing goods directly in the city using alternative transportation means,
- e-commerce pick-up points – enabling transporters to deliver parcels to single locations without having to go from door to door.

The next group of the measures is based on market solutions. They come as the most common option adopted by the local authorities to reduce externalities of road transport. They can be divided into [*Inner Urban Freight*…, 2013]:

- urban congestion charges for certain roads or areas to reduce traffic in those areas,
- subsidies, tax reductions, incentives to foster the implementation of infrastructure, equipment or technology levers.

A well-known solution to make mobility of goods in urban areas more sustainable, is based on new technologies. The role of new technologies in the optimisation of urban logistics can be very diverse and can be applied in different solutions, such as [European Commission, 2013]:

- intelligent transport system,
- alternative transportation means,
- real-time information system,
- crowd-sourced delivery and transport solutions.

Most of the above-mentioned practical solutions are successfully applied in various European countries with help of the European Union funds.

Some of the improvements within the urban transport flows consist of different smart city concept measures. With the rapid development of economy and urban areas all over the world, it is easy to realize the smart city is not so far away [Nowicka, 2014]. Smart city concept is defined as an investment in human and social capital and is as well traditional as modern, ICT-based infrastructure

fuel sustainable economic growth and a high quality of life with wise management of natural resources through participatory government. Smart city concept comes from energy savings concepts, but nowadays one of the most important area in smart city is smart mobility.

For achieving the smart city, which concerns several different areas, it is very important to notice the role of smart mobility that is supposed to consist of cooperative freight transport system, advanced information system, ITS, urban-consolidation centres, off-hour delivery, and road pricing [Komninos, 2008].

Comparatively new direction within city logistics and modern city management, with the great potential to grow, is crowd logistics concept. Crowd-sourced logistics approach is supposed to be a key for the implementation of smart logistics solutions in practise.

3. Crowd logistics concept definition

Crowd sourcing relates to the global sharing economy that has changed a lot a way of using different goods. Sharing economy is a trend involving sharing, lending, and exchanging of products and services [Eckhardt, Bardhi, 2015]. Users get temporary access to resources, services or competences of other units when they are not fully utilized. Contemporary sharing economy is implemented primarily through online platforms, and is based on mutual trust [Olender-Skorek, 2017]. Nowadays, this model is gaining popularity and its main part is engaging a wide range of people (mostly using new technologies) in a given project. This approach has a huge potential to rise, just because it is used in many different areas of life, also in business. In this way, for example, social finance services, alternative monetary systems, or platforms enabling creation of a joint project were created.

The development of various initiatives within the crowd sourcing is conditioned by the development of modern technologies and available in various fields and areas. Along with the technological progress in the digital sphere, one can observe the development and adaptation to new trends in urban areas. Cities begin to operate in accordance with the idea of cities 4.0, which are based on the innovations in digital techniques, especially in the field of automatization, [Mizielińska-Chmielewska, 2018]. Changes and development in economy has led to the popularization of new models in the urban areas management, including the development of the sharing economy. Digital technologies and on-line platforms increase the availability of transactions that enable sharing, while re-

ducing costs and making it easier to connect stakeholders. The most popular areas of the economy of sharing in cities are, for example, the energy area, offices renting, parkings, warehouses, goods, knowledge, and data [Mizielińska-Chmielewska, 2018]. One of the most important areas, however, is mobility and transport.

Crowd logistics designates the outsourcing of logistic services to a mass of entities, whereby coordination is supported by a technical infrastructure. The main aim of crowd logistics is to achieve economic benefits for all stake and shareholders [Mehmann, Frehe, Teuteberg, 2015].

According to quite comprehensive approach, several conditions within crowd logistics concept have to be fulfilled: technological infrastructure, free capacity, crowd network, compensation, voluntary [Sampaio et al., 2017]. So, the crowd logistics can be defined as "(…) an information connectivity enabled marketplace concept that matches supply and demand for logistics services with an undefined and external crowd that has free capacity with regards to time and/or space, participates on a voluntary basis, and is compensated accordingly" [Buldeo Rai et al., 2017, p. 22].

4. Practical crowd logistics solutions

Crowd logistics initiatives can be applied within different crowd-sourced services. Most popular solutions can be distinguished within [Sampaio et al., 2017]:

- services for people mobility,
- services for freight delivery,
- cargo-hitching services.

It is very important to highlight that pure crowd logistics activity should use existent flows – it's one of the necessary condition of this phenomenon. If existent flows are used for services fulfilment, this will contribute to more sustainable city logistics. However, many popular platforms, especially for transportation of people, operate as on-demand transportation services, thus fulfilment is realized by creating new service, rather than exploiting existent ones [Buldeo Rai et al., 2017].

For people mobility, Uber or Lyft are most popular examples of crowd-sourced initiatives. As well, we can find solutions where existent flows are used for people transportation. BlaBlacar, JadeZabiore.pl, OtoDojazd, WolneAuto.pl can be included in this group. In these cases, people plan to travel together with

the selected driver on special platforms. The advantages of such solutions are achieved by both sides, they are mainly economic as well as social. In addition, this way of travelling gives effects in a number of vehicles on the road, and by reducing congestion as well as CO2 emissions.

Within crowd-sourced deliveries main types of offered services consist of door-to-door or store-to-door deliveries. American cities are the leaders in the implementation of this type of projects. In this area, both parties – the customer and the company – are associated on internet platforms, where the inquiry regarding the delivery is placed and potential contractors of the service are in touch. The most popular examples of crowd-sourced deliveries services are Hitch and Roadie. Hitch allows shippers to post requests for items they want picked up and delivered, and travellers to announce journeys they plan to undertake. Roadie is a step further and continuously monitors the movements of its "roadies" and uses machine learning algorithms to recognize travel patterns and automatically identify travellers that can serve requests posted by shippers.

Store-to-door deliveries are focused on B2C market. Some retailers, as Zalando, Wallmart offer same-day deliveries, using crowd-sourced delivery as well as courier services. Another kind of store-to-door delivery can be found in grocery or restaurant food deliveries. Instacart, GrubHub, UberEats or Foodora allow their customers to select a restaurant or retailer from which they want to purchase and then couriers pick up delivery or meal to the customer's home.

Among crowd logistics areas the greatest development potential is in cargo – hitching solutions. The most efficient delivery services can be offered within integration of freight and passengers transport. Cargo-hitching is a kind of concept where spare capacity available in public transport is exploited. It consists of two stages. In the first one, city buses are used to transport goods from distribution centres to bus stops and then, in the second stage, goods are transferred to city freight distributors to be delivered to the end customer [Ghilas, Demir, van Woensel, 2016]. The problem is the public transport is quite difficult to use in crowd logistics initiatives, mainly because of scheduled timetables, and that's why greater flexibility occurs in the case of taxi services.

Conclusions

Crowd logistics is one of the potential directions of urban logistics development. However, it is not clearly obvious, how to use the crowd's potential in logistics in the best way from an economic, social, and environmental point of view. The right direction is not to allow the intensification of flows within the urban transport system. In order to achieve the most important goals of urban logistics, mainly relating to the improvement of flows taking place in urban areas, cooperation between all interested parties is necessary. With an appropriate level of cooperation between stakeholders, it becomes possible to develop new strategies adapted to the requirements and potentials in the area of organization of transport flows within cities. Thus referring to the possibility of implementing crowd logistics solutions in Polish cities, we can focus on the numerous benefits that they would bring. However, it is also worth paying attention to the barriers to their implementation. The author's research experience, in-depth literature research and interviews conducted among the Polish cities administratives, indicate the barriers and difficulties in this area.

They may occur because of financial reasons, legal, infrastructural or social conditions [Pasternak, Sadowski, 2014]. Financial possibilities in the case of Polish cities are often a crucial factor. Expenditures for the implementation of the crowd logistics solutions are already required at the conceptual stage, thanks to which we can determine the preferences of residents or their expectations relating to logistics solutions in the city. The cash deficit may, on the one hand, affect the lack of the possibility of implementing the concept in practice, as well as it becomes a problem when the estimates of investments or projects are poorly planned.

As concerns the legal barriers, it is worth paying attention to several aspects. They may, in some cases relate to restrictions resulting from existing development plans, or the lack of them. During the implementation of the new crowd logistics initiatives with the participation of local administrations, the barriers can come from the complicated procedures that must be subordinated before the investment begins, and which have the greatest impact on the time that must elapse from the projecting of the solution to its implementation.

The next problem in crowd logistics initiatives implementation may influence the character of the city infrastructure. First and foremost problems can occur in urban development system, that often prevents the implementation of new communication solutions. This problem can affect many cities – both European and located in other regions of the world.

Social barriers may be associated with the lack of approval of new solutions by the inhabitants of the urban area. The residents' reluctance may result from ignorance about the opportunities and benefits that residents and city users can relate to.

Comparing the crowd logistics solutions implemented in the European cities and urban areas from all over the world, the development of Polish cities can be noticed in the area of crowd logistics initiatives in passenger transport. However, taking into account the fact that the most interesting initiatives in this area are undertaken in American metropolises, where financial opportunities are almost unlimited, they can be treated as good practices in selected logistics strategies.

References

Buldeo Rai H., Verlinde S., Merck J., Macharis C. (2017), *Crowd Logistics: An Opportunity for More Sustainable Urban Freight Transport?* "European Transport Research Review", Vol. 9(39), https://link.springer.com/content/pdf/10.1007%2Fs12544-017-0256-6.pdf (accessed: 3.04.2018).

Civitas Wiki (2015), *Smart Choices for Cities. Making Urban Freight Logistics More Sustainable*, http://www.eltis.org/sites/eltis/files/trainingmaterials/civ_pol-an5_urban_web-1.pdf (accessed: 4.05.2018).

Eckhardt G.M., Bardhi F. (2015), *The Sharing Economy Isn't About Sharing at All*, "Harvard Business Review", https://hbr.org/2015/01/the-sharing-economy-isnt-about-sharing-at-al (accessed: 28.01.2018).

Ehmke J. (2012), *Integration of Information and Optimization Models for Routing in Urban Logistics*, Springer-Verlag, New York.

European Commission (2013), *A Call on Auction on Urban Logistics*, SWD(2013) 524 final, 17.12.2013, Brussels.

Gatta V., Marcucci E., Le Pira M. (2017), *Smart Urban Freight Planning Process: Integrating Desk, Living Lab and Modelling Approaches in Decision-making*, "European Transport Research Review", Vol. 9(3), pp. 1-11.

Ghilas V., Demir E., van Woensel T. (2016), *An Adaptive Large Neighborhood Search Heuristic for the Pickup and Delivery Problem with Time Windows and Scheduled Lines*, "Computers & Operations Research", Vol. 72, pp. 12-30.

Hajduk S. (2017), *Bibliometric Analysis of Publications on City Logistics in International Scientific Literature*, "Procedia Engineering", Vol. 182, pp. 282-290.

Inner Urban Freight Transport and City Logistics (2013), EU-funded Urban Research. Transparences, www.eu-portal.net (accessed: 2.02.2018).

Kiba-Janiak M. (2016), *Kluczowe czynniki sukcesu logistyki miejskiej z perspektywy zarządzania miastem*, „Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu", nr 420, pp. 141-152.

Mehmann J., Frehe V., Teuteberg F. (2015), *Crowd Logistics − A Literature Review and Maturity Model*, Proceedings of the Hamburg International Conference of Logistics, Hamburg.

Mizielińska-Chmielewska M. (2018), *Inteligentne miasta podążają za modelem ekonomii współdzielenia*, http://www.inteligentnemiasto.com/smart-cities/inteligentne-miasta-podazaja-za-modelem-ekonomii-wspoldzielenia (accessed: 2.03.2018).

Nowicka K. (2014), *Smart City Logistics on Cloud Computing Model*, "Procedia – Social and Behavioral Science", Vol. 151, pp. 266-281.

Komninos N. (2008), *Intelligent Cities and Globalisation of Innovation Networks*, Routledge, London – New York.

Olender-Skorek M. (2017), *Rosnące znaczenie współdzielenia we współczesnej gospodarce*, „Ekonomiczne Problemy Usług", vol. 1(126), pp. 255-267.

Pasternak Ł., Sadowski A. (2014), *Bariery i ograniczenia w logistyce miejskiej*, „Studia Miejskie", vol. 15, pp. 9-19.

Sampaio A., Savelsbergh M., Veelenturf L., Woensel T. van (2017), *Crowd-based City Logistics*, SCL Report Series No. 17-02.

Szołtysek J. (2014), *Perspektywy logistyki miasta*, „Logistyka", nr 4, pp. 7-10.

Taniguchi E., Thompson R.G., eds. (2015), *City Logistics. Mapping the Future*, CRC Press, Boca Raton, FL.

Taylor M.A.P. (2005), *The City Logistics Paradigm for Urban Freight Transport*, Proceedings of the 2nd state of Australian cities conference.

United Nations (2016a), *The World's Cities in 2016*, http://www.inteligentnemiasto.com/smart-cities/inteligentne-miasta-podazaja-za-modelem-ekonomii-wspoldzieleni (accessed: 12.04.2018).

United Nations (2016b), *World Urbanization Prospects*, Department of Economic and Social Affairs, Population Division.

CROWD LOGISTICS – KONCEPCJA I MOŻLIWOŚCI APLIKACYJNE W POLSKICH MIASTACH

Streszczenie: W artykule zostały zaprezentowane koncepcje organizacyjne rozwiązań z zakresu crowd logistics, zmierzające do usprawnienia i zoptymalizowania procesów przepływów pasażerów i ładunków na obszarach miejskich. Analizie poddano możliwości zastosowania koncepcji crowd logistics, rodzaje rozwiązań, które w tym zakresie można stosować, a także korzyści wynikające z ich wdrażania, zarówno dla mieszkańców, przedsiębiorców, turystów, jak i władz. Autorka dokonała przeglądu doświadczeń oraz rozwiązań crowd logistics stosowanych w światowych metropoliach i na tej podstawie określiła, które z nich mają szanse adaptacji w polskich miastach. Głównymi celami artykułu były zatem: analiza możliwości zastosowania koncepcji crowd logistics w warunkach polskich, jako rozwiązania usprawniającego funkcjonowanie miasta, oraz wskazanie barier we wdrażaniu w Polsce tego typu rozwiązań.

Słowa kluczowe: crowd logistics, logistyka miejska, ekonomia współdzielenia.