DIRECTION OF CITY TRANSPORT SYSTEM DEVELOPMENT - CROWD LOGISTICS CONCEPTS

Jagienka RZEŚNY-CIEPLIŃSKA

WSB University in Gdansk, Gdansk, Poland, EU, jrzesny@wsb.gda.pl

Abstract

Organising and coordination of goods and people transportation is the main area of city logistics and should be included in a policy pursued by city authorities towards various city space users. Unfortunately, as far there is a lack of comprehensive approach on passengers and freight flows therefore in different issues they are treated separately. So, the strong need is worth noting to seek the best solutions leading to achieve city logistics goals and included in the people and goods transportation assumption.

The main aim of my research is to find out which crowd logistics solutions are most effective and satisfying from the point of freight and passengers flows improving. The presented study is mostly based on interviewing main stakeholders engaged in city transport system problems: managers of transport and forwarding companies, passengers transport companies and city boards representatives. Moreover, the research is based on the analysis of practical crowd logistics solutions and publications prepared by city logistics associations. In the theoretical part of the study, author uses existing materials from public resources. The findings of the research are gasping to present the advantages of integrating passengers and freight transport towards city logistics goals. The worth noting is that to advance operational integration of people and goods transport services, integrating at the business and institutional levels in this area are required.

Keywords: Crowd logistics, city logistics, passengers and cargo flows

1. INTRODUCTION

Urban development, encouraged by increase in number of cities inhabitants, has brought several imbalances in cities. Cities must now start on a process of transformation by implementing new strategies to meet the challenges of urbanization, demographic change and the new demands of protecting natural environment. Therefore, it is really crucial to plan and manage cities' expansion by supporting economic growth and competitiveness meanwhile maintaining social cohesion and environmental sustainability.

Traditionally, the flows of people and goods within the urban areas are treated separately, although both shares the same infrastructure and influence each other. It can't go unnoticed the main advantages of the city transport system development may result from the integration of passengers and cargo transportation within the urban areas. Although, several authors discuss the benefits of such an integration, there is still a lack of this approach in the literature. Caring for the flows of goods and passengers through integrated urban logistics strategies should be a determinant of urban management. Thus, city logistics is a very important concept aimed at the integration of existing flows in order to solve city management problems. city logistics may be also defined also by aims, being identified as [1,2]:

- improving quality of life,
- improving the flows of people and goods,
- protecting the environment.

What is worth noting, urban logistics requires a deep commitment from all stakeholders engaged, such as: authorities, shippers, freight carriers, public transport operators, and other participants, representing different aims and expectations towards urban logistics.

The main purpose of the paper is to indicate the crowd logistics initiatives that increase urban transport sustainability in the area of goods and people flows. In order to reach the point, following research questions have been conducted:

RQ1 - Which crowd logistics solutions are the best choices from the perspective of the stakeholders' aims?

RQ2 - Which crowd logistics solutions in the best way fulfill the sustainability assumptions consisting of the social, effectivity and environmental issues?

The process consists of desk research - systematic literature review within the area of city logistics, crowd logistic and share economy, and field research - semi structured interviews with the representatives of city logistics stakeholders.

2. STAKEHOLDERS IN URBAN TRANSPORT SYSTEM

Congestion and environmental problems caused by passenger and freight transport may be observed in many European cities. For many years such problems were mainly discussed from a narrow perspective of private stakeholders [3]. Public authorities were working within their own area mainly concerning internal effects of transport businesses. Because of a lack of holistic point of view, all parties involved in urban transport system were treated as a whole [4]. Cooperation in urban management process in the way to improve flows within the urban areas is essential. Thus, there is a strong need to identify all stakeholders engaged in urban transport system, that should be included in the cooperation. Heterogeneous stakeholders operating in cities, in fact, interact, both competing and cooperating, but are characterised by different objectives (**Table 1**) [5]. Stakeholders can be generally described as those who are interested in the decision to be made, even if they are not the final decision-makers or they don't play a formal role in the decision making process [6]. The stakeholders pertain both to the private and public sphere and can be divided into several main groups [7]:

- authorities,
- shippers,
- freight carriers,
- public transport operators,
- residents,
- other traffic participants.

Within the authorities group the following stakeholders can be distinguished [8]: the local government, the national government, and for some issues even the European Commission. The local authorities focus on an attractiveness of a city. They are mainly interested in the reduction of congestion and environmental nuisances and also in increasing safety of road traffic. From that perspective urban freight transport can be considered as a main contributor of pollution and nuisance. On the other hand, the local authorities aim in having an effective and efficient transport system. So, they are the stakeholders that mostly consider urban transport system as a whole. Thus, their main scope should focus on resolving problems between others actors engaged in urban transport system National authorities are usually rather only marginally involved in urban freight transport as it is mainly seen as a local matter. However, the interests of national authorities (such as reducing congestion and externalities at a national or regional level) affects many urban freight transport operations as well as local authority policies.

Shippers generate freight demand, so their role is organizing freight transport from shippers to receivers. They are all driven by private interests. Shippers send goods to other companies or persons and are often not located in the city - as a result they usually do not feel responsible for urban freight transport issues. Their scope is to maximise their levels of service in terms of costs and reliability of transport. Shippers can be owners of the freight or they can be just responsible for hiring a carrier [9]. Freight carriers usually aim at minimising their costs by maximising the efficiency of their pick-up and delivery tours, and they are expected to provide a

high level of service at low cost. There is a trade-off between a high level of service and the efficiency of freight vehicles loads [10].

Transport operators are the stakeholders carrying out urban freight transport, but in many cases they are restricted by boundaries set by others - for example, opening hours of stores or designated time windows to make the deliveries. What is worth noting - transport operators are often active in a geographically larger area than the city [11].

Public transport operators are most commonly owned by the municipalities but in details it depends on the model of the public transport adopted in the urban transport system. That's why in the most universal models, they had options of performing the services themselves, or contracting out the service to private companies. In practice it means the public transport services may be provided by a mixture of private and publicly owned companies [3].

City residents and city users are the people who live, work, and shop in the city. Residents can experience nuisance by urban freight transport as smell, noise nuisance, or vibration, so they are interested in most sustainable urban transport system [10]. The group of other traffic participants consists of vulnerable road users as cyclists and pedestrians that share the same infrastructure as freight transport vehicles especially in the urban area, and of passenger vehicles that are hindered by double-parked trucks involved in loading and unloading at the kerbside or on the road. As well visitors and tourists can be included into this group. They are also affected by urban freight transport only to a minor degree. Taking into account, having an attractive city which tourists and visitors want to visit is important, and there is therefore an interest in minimising nuisance by urban freight transport [12].

Table 1 Objectives of main stakeholders' groups in city logistics area

	Objectives in the area of city logistics		
Stakeholders	Social	Effective	Environmental
Authorities	→	→	→
Shippers		→	
Freight operators		→	
Public transport operators	→		
Residents	→		→
Other traffic participants	→		→

3. CROWD LOGISTICS CONCEPT

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 [6]. 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 [13]. 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 [14]. This approach has a huge potential to rise, just because it is used in many different areas of life, also in business. 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 [15]. 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 [15]. One of the most important areas, however, is mobility and transport.

Crowd logistics is alternatively termed as crowdshipping, crowdsourced delivery, cargo hitching or collaborative delivery [16]. Due to the novelty of crowd logistics concept and the fact different crowd logistics solutions are still in motion, knowledge on the actual state and impacts of such solutions is limited [17]. Crowd logistics is a concept of sharing in transportation, that aims to improve efficiency and sustainability of the way objects are moved, stored, supplied and utilized across the world by applying concepts from internet data transfer to real world shipping processes. Moreover, crowd logistics relates to a network because technology enables passengers to use the capacity in their vehicles more efficiently, by carrying parcels for others [16].

According to quite comprehensive approach, several conditions within crowd logistics concept have to be fulfilled: technological infrastructure, free capacity, crowd network, compensation, voluntary [18]. So the crowd logistics can be defined the 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” [16].

4. CROWD LOGISTICS SULUTIONS IN PRACTICE

Crowd logistics initiatives can be applied within different crowd-sourced serviced. Most popular solutions can be distinguished within (**Table 2**) [18]:

- 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 conditions of this phenomenon [19]. 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 [16].

Table 2 Practical crowd logistics initiatives

	Crowd	**logistics**	**solutions**
	People	Goods	Integrating
Using existing flows	InOneCar, Blablacar (P1)	Jadezabore, Roadie, Hitch (G1)	KombiBus CargoHirtching Netherland (I1)
Creating new services	Uber,Lyft (P2)	Instacart, GrubHub, UberEats, Foodora (G2)	-
Using joint infrastructure	-	-	CargoTram Zurich, CargoTram Amsterdam, CarGoTram, TramFret (I3)

Within people mobility, two groups of most common crowd logistics initiatives can be met. The first one is represented by Uber or Lyft - most popular examples of crowd-sourced initiatives. As well, we can find solutions where existent flows are used for people transportation. BlaBlacar, InOneCar can be included in this group. In

these cases, people plan to travel together with the selected driver on special platforms or using dedicated applications. The advantages of such solutions are achieved by both sides, they are mainly economic as well as social. In addition, this way of traveling gives external effects in a smaller number of vehicles on the road, and by reducing congestion as well as CO2 emissions. Within crowd-sourced goods 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 (KombiBus, Cargohitching - project applied in Netherlands). Cargo-hitching is a kind of concept where spare capacity available in public transport is exploited. In the first stage, 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 [2]. Problems with scheduled timetables is eliminated in the case of taxi services. In other concepts just the infrastructure of public transport is used (CargoTram concepts in Zurich, Amsterdam, France).

5. CROWD LOGISTICS SOLUTIONS FROM THE PERSPECTIVE OF THE MAIN STAKEHOLDERS' AIMS

City logistics is a concept aiming mainly at the integration of research flows. In order to achieve such goals, involving different groups of stakeholders, engaged in city logistics issues is necessary. (**Table 3**)

Table 3 Crowd logistics solutions from achieving the stakeholders' goals perspectives

	Crowd			**logistics**				**solutions goals**				
	Social			*Effective*				*Environmental*				**Most appriopriate solutions**
Specific characteristics / **Stakeholders**	S1	S2	S3	Ef1	Ef2	Eff3	Ef4	En1	En2	En3	En4	
Authorities	P1 P2 G1 I1	P1 G1 I3	G1 G2 I1					P1 G1 I1	P1 G1 I1 G2	P1 G1	P1 G1 I1	P1 G1 I1
Shippers				P2 G1 I1	P2 G1	P2 G1	P2 G1					P2 G1
Freight carriers				G1 I1 I3	G1	G1 I1	G1					G1
Public transport operators	P1 P2	P1 G2 I1 I3	P1 G2									P1
Residents	P1 P2 I1 G2	P1 G1 G2 I1	G2 G1 P1					P1 G1 I1 I2	P1 G1 I1 G2	P1 G1	P1 G1 I1	P1 G1 I1
Other traffic participants	P1 P2 G2	P1 G1 G2 I1	G2 G1 P1					G2 I1 I2	P1 I1 G22	P1 G1	P1 G1	P1 G2
Most appriopriate solutions	P1 P2 I1	P1 G1	G2	G1 I1	G1	G1	G1	I1	P1 I1	P1 G1	P1 G1	

Every of them represents various scopes and preferences, almost always difficult to reconcile, bit it couldn't be find as a barrier to cooperation in city transport system improvements' implementation processes. Taking into consideration main scopes' areas, regarding social (more specific characteristics distinguished within social area are: local accessibility S1, traffic safety and traffic noise emission S2, health benefits S3), effective (characteristics within effectiveness area are: cost savings Ef1, sufficient partnership Ef2, geographical scale Ef3, sufficient ammount of users Ef4), and environmental (environmental issues regard: reduction in CO2 En1, congestion and emmisions En2, traffic safety En3, efficient usage of loading space En4) issues and more specific characteristics distinguished between them, practical crowd logistics initiatives (**Table 2**) which are most possibly ways to solve urban logistics system problems, were indicated.

6. CONCLUSIONS

This paper is intended to contribute to the development of city transport system solutions with the aim to minimize all negative impacts. In order to ensure and organize a more efficient, sustainable and ecological transport processes within the cities, the integration of passengers and cargo flows within the urban areas should be planned and implemented. Congestion, air pollutions and noise problems are the most visible issues faced by urban system participants.

In order to achieve the main scope and verify the hypothesis, following steps have been developed. The first stage was a literature review within the share economy area, the role of crowd logistics in modern economy, city logistics and main stakeholders engaged in urban transport system. Then, on the basis of literature approach, the practical crowd logistics initiatives have been examined and for the needs of the paper were divided into main groups. On the basis of mentioned analysis, the interviews questions were prepared, and then have been used in practice during the interviews with representatives of city halls and forwarding and transportation companies within the Pomeranian region. The last stage of the research was to answer the research questions and obtain information about crowd logistics initiatives that are approaching the goals of stakeholders engaged in city transport system and from the other side - which are most satisfactory from their social, effective and environmental perspective.

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