Differences Between Typical Logistics Systems and Other City Logistics Generators

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Logistics flows in urban areas are generated by systems engaged in various business. Flows generators can be divided into typical logistics systems (logistics, distribution centers, freight terminals, logistics systems of companies, etc.), for which logistics is the core business, and other generators of city logistics (trade, hospitality, craft, service facilities etc.). These two categories of generators differ in terms of flow volume, location, infrastructure, surrounding conditions, form of goods, logistics units and consolidation system, logistics demands, goods handling, etc. In this paper, the basic differences between typical logistics systems and other generators of city logistics are analyzed, thus achieving the basic goal and contribution of paper.

Key words: city logistics, logistical flows generators, typical logistics systems, business

1. INTRODUCTION

Cities have long been a places of intensive performing of the flow of people, information, goods, materials and freights. Various trends and processes (urbanization, world population growth, urban mobility growth, globalization, growth of goods and services production and consumption, etc.) further contribute to the scope of these flows in urban areas [1]. Therefore, in recent decades, the field of city logistics has attracted increasing attention of researchers [2, 3, 4, 5, 6]. City logistics flows generators are different categories of facilities in or outside the urban area, engaged in various businesses.

Flows are generated by systems whose core business is logistics, such as logistics, distribution centers, freight terminals, etc. In this paper, these systems will be called typical logistics systems (TLS). The flows of facilities engaged in other businesses (trade, hospitality, services, crafts, culture, education, administration, etc.) are also very important. These facilities will be named in this paper as other generators of city logistics (OGCL). Flows performing affects the continuity of

facilities supply and the total volume of goods transport, and thus the vitality and functionality of the area.

Therefore, successful flows planning, organization and performing are important both for their generators and for the entire urban area and community [7]. In addition to the above, significant generators of city logistics flows are industrial systems and households, which due to their specific characteristics represent special categories of city logistics flows generators. They will not be considered in this paper.

There are numerous differences between TLS and OGCL in terms of flow volume, location, infrastructure, surrounding conditions, form of goods, logistical units and consolidation systems, logistical demands, goods handling, etc. The topic, goal and contribution of this paper is the analysis of these differences.

The paper is organized as follows. After the introduction, city logistics generators are described, and in the third chapter, the basic differences between TLS and OGCL are listed and described. Finally, concluding remarks and directions for future research are given.

2. CITY LOGISTICS GENERATORS

City logistics generators are all facilities in which some of the urban functions are performed and which initiate some of the logistics demands [8]. These are places in urban areas where the flows of goods, materials or freights begins or ends. They are one of

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the basic subsystems of city logistics. One of the basic features of the generators is the large spatial dispersion, which contributes to the mass performing of logistical flows in the entire urban area. Generators are described by attributes such as: time of receipt/dispatch, core business, size, ownership, delivery frequency and size, supply and ordering system, structure of goods, location, etc. Attributes differ in relation economic sector, but also within the same business [9]. The differences between logistics and systems for which logistics is not core business are especially large. Within the same business, the differences are especially large in terms of location. Thus, the central urban zones (central business district - CBD) are characterized by a high density of generators, mostly limited infrastructure with very narrow streets and sidewalks, insufficient number of parking spaces and various access restrictions [10, 11], which significantly complicates the functioning of urban facilities, especially their supply [9, 12, 13, 14].

In addition, the space lack and the high price of land significantly affect the reduction of storage space of commercial facilities, and in the function of the development of core business that makes a profit [6, 12]. These characteristics of CBD significantly affect the logistical demands of generators and their flow characteristics (smaller size and higher frequency of time-defined deliveries, unregulated stopping place of vehicles, delivery duration, etc.). The need to preserve their authenticity and attractiveness, as opposed to the growth of logistics demands and problems of flows performing, is a great challenge for logistics planners [9, 15].

3. CHARACTERISTICS OF TYPICAL LOGISTICS SYSTEMS AND OTHER CITY LOGISTICS GENERATORS

TLS means logistics systems with dedicated infrastructure, equipment and skilled labor. This category of city logistics generators includes logistics, distribution centers, freight terminals, logistics systems (e.g. large warehouses) of companies for which logistics is not core business, etc. These systems are significant generators of city logistics flows.

OGCL in this paper means trade, hospitality, service, craft, administrative and other facilities in urban areas, for which logistics is not core business and whose infrastructure is adapted to the realization of core business. In this paper, industrial systems and households will not be analyzed, which due to their specific characteristics are special categories of generators of city logistics flows.

TLS and OGCL differ in relation to several criteria (Table 1). The differences are especially large for

OGCL in CBD, where the biggest logistics problems are present [16].

Volume of flows generated by TLS is usually larger than in the case of flows from/to OGCL. Namely, a large part of the flows that start or end in TLS are macrodistribution flows, which are performed over longer distances, vehicles with higher carrying capacity and with a higher degree of goods consolidation. The exceptions are microdistribution flows, which are generated by city logistics terminals and other TLS that supply OGCL. Flows generated by OGCL (deliveries and collection of goods, materials to/from facilities) are usually smaller in volume and high in frequency. These dynamics of goods and materials delivery and collection is caused by the action of numerous factors. Due to the specific architectural-construction and traffic characteristics and regulations, in the CBDs of many cities, only passenger or cargo vehicles of small capacity (less than 3.5 tons) can be used for delivery [8]. In addition, there is an increasing number of generators, whose storage space (and thus the level of inventory) has been significantly reduced or eliminated in recent decades, due to the high cost, as well as the expansion of space for core business [17]. Finally, the unpredictability, variability and diversity of demand for goods and services, a wide range, shorter shelf life and demand for freshness of goods, very often require ordering and deliveries organization on a short-term level.

TLS and OGCL also differ in terms of location. Given flows characteristics, TLS are most often located outside or on the outskirts of cities, but always in traffic-friendly locations. OGCL are located in all parts of the city to be easily accessible to as many users as possible. The location affects the logistical flows characteristics and differences of logistics systems also within the OGCL category. Namely, generator logistics in CBD can differ significantly in relation to generator logistics on the city outskirts (less available space, higher real estate prices, more intensive traffic flows, architectural features of historical parts of the city, infrastructure restrictions, stricter legal restrictions, etc.).

The TLS infrastructure is dedicated, adapted to logistics activities realization. On the other hand, OGCL infrastructure is intended primarily for core business (trade, hospitality, services, crafts, administration, etc.) and is often not adapted to the performing of logistics activities (uneven terrain, thresholds, stairs, narrow doors, corridors and passages, etc.). Also, in addition to their own infrastructure and public roads, for logistics activities performing OGCL often use other public infrastructure: sidewalks, public parking space, etc. Therefore, there may be mutual interference, reduced process efficiency and security of both

OGCL and other users of urban infrastructure in the implementation of logistics operations. Also, OGCL are not responsible for the maintenance of this infrastructure, so they cannot directly affect its quality. Surrounding conditions in which the logistics activities are performed include weather, traffic conditions and other external and internal factors and also differ in TLS and OGCL.

In the first case, there is a significantly higher degree of control, i.e. a lower degree of dependence on surrounding conditions, because operations such as receiving, dispatching and parking vehicles, loading, unloading and reloading of goods, etc. realized within the logistics system. On the other hand, when delivering or collecting goods to/from OGCL, performing

these operations is largely dependent, conditioned and limited to the external (public transport, pedestrian flows, architectural and construction features of the area, regulations, infrastructure condition, quality and characteristics, location and size of parking spaces), weather conditions, etc.) and internal factors and influences (size of the facility for which the delivery is made, storage space size, core business activities, turnover of users in the facility, etc.).

OGCL have a greater degree of control over internal than external factors. However, some of the negative external influences of the surrounding can be reduced by various interventions (e.g. protection from weather conditions by installing canopies, wind shelters, snow and ice removal, etc.).

Table 1. Differences between typical logistics systems and other city logistics generators

System type Criterion	Typical logistics systems	Other city logistics generators
Flows volume	Usually a larger	Usually a smaller
Location	Usually on city outskirts	In all parts of the city
Infrastructure	Dedicated	It is most often intended for the core business and is not sufficiently adapted to logistics activities.
Surrounding conditions	Controlled	Variable, often uncontrollable
Form of goods, logistics units and consolidation	There is usually standardization, modularity, compactness and unification of logistics units and consolidation procedures, which are most often performed up to the level of a pallet, container or swap body.	Great variety of forms and logistic units. Smaller units (mini-load units, boxes) are more often used, but they are not compact enough due to inadequate consolidation. Also, in many cases there is no consolidation.
Logistical demands	Greater degree of homogeneity and predictability	Lower degree of homogeneity and predictability
Goods handling	Most often by applying various mechanized handling equipment: forklifts, cranes, automated systems, etc.	The most commonly manually or by applying simple auxiliary equipment (e.g. handcarts)

There are also significant differences in terms of form of goods, logistics units and consolidation process. In TLS there is mainly homogeneity of forms of goods, standardization, modularity, compactness and unification of logistics units and consolidation process. Consolidation is usually done to the level of a pallet, container or swap body. On the other hand, logistics units in the flows to/from OGCL are often insufficiently compact due delivery size, inadequate goods consolidation and variety.

In this case, the pallets are less often delivered to the user, i.e. reloaded during delivery, but only serve for consolidation and transporting goods to several facilities in one tour, after which they remain in the possession of the supplier. Smaller units (mini-load units, crates for drinks, fruits, pharmaceuticals, etc.) are more commonly used. Also, in many cases there is no consolidation, so there is a great variety of forms of goods (bags, boxes, barrels, etc.).

The diversity of forms of goods, logistic units, means of transport, surrounding and infrastructure conditions and the variability of demand affect the variability, inhomogeneity and insufficient predictability of logistical demands in flows realization to/from OGCL. On the other hand, the flows performed by TLS are characterized by a higher degree of deterministic, homogeneity and predictability of demands. Thus, a typical logistical demand in a TLS is pallet loading/unloading using a forklift and transport between the loading and storage area. On the other hand, in OGCL flows, it is not possible to clearly identify a typical logistical demand that occurs during the implementation of the same operations.

Previous differences also affect differences in goods handling. Namely, the volume of flows, control over infrastructure and surrounding conditions, standardization of logistics units, a higher degree of homogeneity of logistics demands in TLS enable and

encourage intensive application of various handling equipment: forklifts, cranes, automated systems, etc. On the other hand, goods handling in OGCL are often realized manually or by applying simple auxiliary equipment (handcarts, lift pallet trucks, etc.).

Although the characteristics listed in the third column of Table 1 are inherent in most OGCLs, it is important to note that an increasing number of companies are beginning to take logistics more seriously and take it into account when planning facilities and infrastructure. In that sense, the goal of OGCL is to achieve a balance between the goals of the core business and logistics, where logistics should be given importance in relation to the scope and intensity of logistics operations and flows that the facility realizes. Therefore, the larger the scope of logistics operations and flows, which the facility realizes, it is necessary to pay more attention to the development of logistics infrastructure and resources.

4. CONCLUSION

Logistics flows in urban areas are generated by typical logistics systems (logistics, distribution centers, freight terminals, company warehouses, etc.) and facilities engaged in other business (trade, hospitality, crafts, services, etc.). There are significant differences between these systems in terms of flow volume, location, infrastructure, surrounding conditions, form of goods, logistics units and consolidation, logistics demands, goods handling, etc.

In this paper, the differences between typical logistics systems and other generators of city logistics are analyzed, thus achieving the basic goal and contribution of the paper.

Since the paper does not analyze industrial systems and households in relation to typical logistics systems and other generators of city logistics, the subject of future research may be a comprehensive structuring and comparative analysis of all characteristics and categories of city logistics generators. Differences between city logistics generators in relation to location (generators in central and peripheral city zones) may also be the subject of future research.

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REZIME

RAZLIKE IZMEĐU TIPIČNIH LOGISTIČKIH SISTEMA I OSTALIH GENERATORA CITY LOGISTIKE

Logističke tokove u urbanim sredinama generišu sistemi koji obavljaju različite delatnosti. Generatori tokova mogu se podeliti na tipične logističke sisteme (logistički, distributivni centri, robni terminali, robno-transportni centri, logistički sistemi kompanija itd.), kojima je logistika osnovna delatnost, i ostale generatore city logistike (trgovinski, ugostiteljski, zanatski, uslužni i drugi objekti). Ove dve kategorije generatora razlikuju se sa aspekta obima tokova, lokacije, infrastrukture, uslova okruženja, pojavnog oblika, logističkih jedinica i sistema ukрупnjavanja, logističkih zahteva, robnih manipulacija itd. U ovom radu analizirane su osnovne razlike između tipičnih logističkih sistema i ostalih generatora city logistike, čime je ostvaren osnovni cilj i doprinos rada.

Ključne reči: city logistika, generatori logističkih tokova, tipični logistički sistemi, delatnost