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REORGANIZATION OF THE POSTAL SECTOR AT URBAN AREAS

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Abstract

Urban areas are increasingly confronted with a chronic problem of traffic jams. The overload of road infrastructure is obvious. This is reflected in the quality of life in urban areas. The consequence of congestion is also the decline in the quality of postal services. The liberalization of the postal services market contribute to a range of good solutions but has brought one negative externality - the overlapping of network capacity. Such an overlapping reduces the performance of the entire postal sector, i.e. induces under-utilization of the existing capacities, and disrupts sustainable development. The paper will consider scenarios that will propose solutions in this area, trying to coordinate the public interest with the interests of private postal operators.

1. INTRODUCTION

Postal traffic has undergone thorough changes during the past three decades. The main ones are the process of liberalization and the process of deregulation, which have opened the doors of competition. A burden, but a responsibility as well of the national postal operators lies in the fact that they were entrusted with the tasks regarding the universal postal service. The universal postal service may be a key instrument to a steady economic growth of a country. Such a view has not yet been

adopted by the competition i.e. private postal operators, namely they focus on the most appealing parts of the postal service market which are primarily express services (the added value services) and they mostly focus on urban areas. In that regard one may notice the overlapping of the postal service operators' network capacities which on one hand decreases the quality of the postal service and on the other worsens the overall features of the traffic in the urban areas (lack of parking spaces, traffic congestions, pollution of the environment etc.)

The role of the postal sector is changing from the root. Demand for delivery of letters, newspapers, flyers and other documentation is decreasing as electronic communication develops further. At the same time there is a rise in demand for package delivery due to the growth of e-commerce and just-in-time management method in production process. A decrease in demand for mailing letters is a result of the development of digitization and electronic substitutes for said services. User communication which was in the past being conducted via mailing letters is today widely replaced by websites and other electronic means. When a decrease in demand for mailing letters occurs due to its electronic substitute it is usually a lasting change.

2. E-COMMERCE

E-commerce is a result of the popularization of internet transactions i.e. the possibility of conclusion of buy and sell agreements in virtual environment. Significant advantages of e-commerce are [1]:

1. availability 24/7
2. delivery to home address (no need for a trip to the store)
3. easier comparison of offers
4. affordable prices
5. easier finding of rare products
6. significant amount of product information
7. bigger selection than the one found in traditional shops
8. the right to a refund for every distance sale

E-commerce is not exempt from influencing the environment. The basic feature of e-commerce is its delivery service. As the amount of transactions via e-commerce increases so does the number of deliveries and delivery vehicles. Generally speaking, there is a noticeable increase in the number of package deliveries (with a decrease in their mass at the same time) which consequently leads to the increased frequency of deliveries.

Digitalization has influenced retail to redefine its online business management aside from its physical sales network. Key factors that initiated such change, developed due to the influence of internet. This change enabled small and medium businesses to offer their services to customers all around the world. In such an environment where products available in retail stores are delivered to home

address as well, the role of a postal operator as a link between a seller and a customer is becoming all the more important.

The basic factor of growth of e-commerce i.e. package delivery segment represents a growing challenge regarding urban logistics. Hence the last mile segment is the main point of concern for postal operators who have (especially national postal operators) long experience in dealing with the problem of city logistics. This area includes activities that increase traffic congestions as well as the pollution of the environment via the emission of exhaust gases. Undelivered packages may require additional attempts of delivery which may represent a significant problematic field for postal operators.

3. URBAN AREAS

The amount of traffic congestions is constantly growing which influences the efficiency of postal services. The key factor in calculating costs of traffic congestions is the assessment of operating expenses of vehicles per hour. In the case of vehicles being stuck in traffic their operating expenses increase due to higher fuel consumption per km, the time of the driver that is wasted, the transportation vehicle being idle etc.

Traffic congestions impact deliveries in several ways:

1. reducing the time available for pickups and increasing the number of empty trips as a consequence,
2. decreasing average speed on congested roads
3. as reliability of delivery time decreases, companies may increase their number of vehicles as a response and try to ensure that they have a large enough transport capacity to satisfy their clients' needs

Mentioned effects have insufficiently utilized transport capacity as a consequence.

The amount of traffic and congestions in urban areas is growing more and more, resulting in postal operators having to deal with new challenges to keep shipment transportation systems reliable. Impacts on supply chains are becoming more significant not just for national operators, but for the private sector operators as well.

The two main decisions for shipment delivery are the market size and the number of delivery vehicles. Increase in the number of traffic congestions may cause these decisions to change with various cost-related factors. With the rise in congestions, the time needed for delivery vehicle to get to the next delivery point in urban areas is increasing. This becomes more noticeable during rush hour. In other words, potential delivery area for a single vehicle is becoming smaller as a direct consequence of congestions which causes the need for more vehicles on road network. Aside from directly related added costs regarding driving staff and vehicles, these changes give rise to additional expenses in regard to constant adjustment of schedule for carriers and deliveries.

With progressive development of e-commerce postal services strive to satisfy customer expectations for faster and more flexible deliveries. Current developing models have a difficult task of surviving if they do not adjust to the cost-efficient solution. Existing models currently have shortcomings in regard to flexibility and the assurance of cost efficiency. With the expected increase in the number of package deliveries from 74 billion in 2017. to 100 billion in 2020. [2], postal operators will be directed toward better cooperation for the consolidation of the amount of packages along their infrastructure.

Trends in customer behaviour have a significant influence on postal operators. Users in urban areas have at their disposal a wide assortment of options (so not only do they demand products in a certain manner, but at a certain time as well). In the case of online shopping instead of adjusting their daily schedule to the reception of a delivery, users tend to ask for the delivery to be adjusted to their personal schedule and so options of delivery scheduling and its tracking are becoming basic services offered to the customers. Initiators of user habits are: best price, time-saver, the option of ordering anywhere and anytime and exempt from postage.

4. LAST MILE ISSUE

Cities consist of human clusters which encourage development of transport infrastructure and communication networks. On the other hand, placing a large part of populace in a limited space causes air pollution, noise, as well as other negative effects on the environment and by encouraging it e-commerce makes the issue worse. Package delivery to home address as well leads to higher pollution of the environment (higher emission by postal operators).

The expression 'last mile' originates from telecommunications where it is used to describe technologies and processes applied for connecting end user to communication network. Last mile problem includes three basic entities: user, seller and delivery provider, where each entity has its own set of specific skills and challenges [3].

Users' set of expectations regarding speed, flexibility, safety and price of delivery is becoming larger and more complex. They are gradually evolving and moving toward this expectation set's growth.

Regarding urban areas, postal operators' tasks are becoming more and more demanding which is primarily a consequence of the growing segment of e-commerce. The biggest problem is failed attempts of delivery which results in higher costs in this segment of business activities (failed delivery rate in France in 2015. was 16.2% [4]).

With the population increase in the cities and the increase in the amount of business activities, urban areas may become overloaded which may have an adverse effect on product transportation. Delivery in urban areas leads to traffic jams and increases noise and air pollution, which effects the quality of living. In that regard one should strive toward balance between service quality and the impact on

the user's quality of living. Namely, users of e-commerce expect their package deliveries to be quick and cheap, but at the same time wish to enjoy clean air, without traffic jams etc. That is why it is important to come up with an optimal solution for often conflicting demands.

Intensive development of e-commerce has caused a significant expansion of the express services market. Last mile in e-commerce is regarded as the most expensive, least efficient and most polluting section in the whole logistic chain [5]. One of the main problems concerning last mile is multiple attempts of delivery in a short time interval. This leads to inefficient activities and high transportation costs which in turn narrows development options of e-commerce.

Online salespeople most often adopt the two-echelon approach (warehouse-delivery units-users) for rendering user services in urban areas with high population density [6]. In this approach warehouses conduct the packaging of products and their delivery to the appropriate delivery unit whose function is the reception and consolidation of shipments from various warehouses and their delivery to the end user in their delivery areas.

With the growth of e-commerce, user expectations are moving towards the center of attention of once business-oriented package market. Big players of the e-commerce have identified last mile as a key attribute regarding competition. Different options of delivery as well as their perceived quality are basic criteria for user decision making and so have a direct influence on the success rate of said individuals in the field of e-commerce.

Digitalization has rapidly changed the way in which users satisfy the two basic needs via postal networks: communication and purchasing. The exceptional growth of e-commerce is supported by new user segments, new products, new channels of communication etc.

Liberalization of the market aside from its user benefits may have certain negative effects as well. Such approach may lead to network doubling, which is a consequence of mutual competing among rivals. Network nature of the postal sector differs not from other network systems. Overlapping of mutual characteristics is evident in transport and communication systems when it comes to creating and organizing networks where there is a need for coverage of a certain territory. For effective and secure operations in urban areas, it is necessary to ensure coordination while taking the limitations of urban infrastructure into consideration. On the other hand, aspects such as stopping points which influence the safety of the transport process, significant time loss, increase in costs etc. need to be taken into account.

In order to avoid doubling of available capacities, operators need to cooperate. In regard to package shipments it is necessary to consider all available models of delivery as to be ready for the challenges traffic brings. The key challenge for regulators is defining present user needs as well as their evolution, consequently it is necessary for the postal operator market to develop quickly.

5. LAST MILE APPROACHES

In order to adjust to the last mile market demands, it is crucial to realize the significance of the roles of automatization, real-time data prediction and management, as well as flexible delivery networks. One may say that there is no simple solution considering that infrastructure, regulation and economic environment vary from market to market.

Flexible transportation networks may include more efficient ways of using available market transportation capacities (getting higher factor of utilization of transport space, decreasing costs, achieving quicker end-user connection, decreasing harmful influence on the environment). They also contribute to the possibility of easier shipment routing between various types of transport as to further interconnection.

Aside from higher level of automatization processes in processing centers, automatization may also include the relocation of autonomous vehicles and robots to reduce labour costs, increase productivity and improve service quality.

Data management enables salespeople and postal operators better predictions and asset position in order to reduce waste in their supply chains and to make supplies more accessible. It also makes better view of transport routes possible, enabling postal operators more efficient route and exception management, as well as providing tracking to enhance customer service.

The last-mile technical innovations are:

1. drones – drone flight is controlled autonomously from a remote. The main factors which incentivize the use of drones are expenses and the importance of fast delivery
2. autonomous vehicles - autonomous vehicles that are capable of partial or full self-movement will become a reality in the near future. It is expected that they will improve safety, reduce fuel consumption and enhance worker productivity
3. self-service lockers -by being more flexible and efficient, this kind of delivery is also cheaper for the user compared to home address delivery and it reduces delivery time as well so the user isn't constrained by the time frame provided for home delivery
4. delivery to car –provides access to the user's car in order to realize delivery. The user downloads the appropriate application and then connects his bank account with the car service receipt. On delivery day users park their car in the specified address area and a delivery person realizes delivery in the designated time frame. Customers receive a confirmation when the car is unlocked and upon delivery, they lock it.
5. delivery inside home when customer is away- On delivery day the operator sends a confirmation of the four-hour delivery period during which it is estimated that delivery person will arrive at the customer's address. Before they arrive, the user receives a confirmation and may, if they choose, observe delivery process as it is happening. A delivery person sends a

request to unlock the user's door via a manual scanner. The operator verifies that the packages belong to the specified address and that the delivery person is in front of the door and in the process of unlocking them. When the delivery is complete and the doors are locked, the user receives a final confirmation and may use a video recording of delivery.

6. crowdsourced delivery – when the order is complete, the company application for crowdsourced delivery, assigns the delivery to occasionally hired couriers. Couriers may offer to accept a local delivery or they can automatically be assigned a request based on their proximity to the pick-up location. After the package pick-up, the courier in charge delivers the consignment to the customer using his own vehicle. Pick-up and delivery may be realized immediately or inside a requested time frame.

6. CONCLUSION

The postal sector is going through a turbulent period. Postal operators recognize the importance of implementing new technologies to keep up with the changes that are happening. E-commerce is an area of great challenge for postal operators, where the dominant is primarily parcel shipping. The increase in the amount of shipments resulting from this also leads to increased competition, which has certain negative consequences in a limited urban infrastructure.

On the other hand, customers are becoming increasingly demanding about the services they are provided. In that regard, it is necessary to find a balance between the user requirements and the impact of the postal sector on the environment in which it operates. In order to achieve this, closer cooperation of postal operators is needed in order to make the most out of the use of available capacities (better utilization of cargo space, reduction of congestion and environmental pollution, reduced number of unsuccessful deliveries, etc.).

REFERENCES

- [1] Chiu, C. M., Wang, E. T., Fang, Y. H., & Huang, H. Y. (2014). Understanding customers' repeat purchase intentions in B2C e-commerce: the roles of utilitarian value, hedonic value and perceived risk. *Information Systems Journal* 24(1), 85-114.
- [2] Accenture, (2018), How could last mile delivery evolve to sustainability meet customer expectations?
- [3] Lee, H. L. (2016). White Paper. Technological Disruption and Innovation in Last Mile Delivery.
- [4] Akeb, H., Moncef, B., Durand, B. (2018) Building a collaborative solution in dense urban city settings to enhance parcel delivery: An effective crowd model in Paris, *Transportation Research Part E: Logistics and Transportation Review*

- [5] Gevaers, R., Van de Voorde, E., Vanelslander, T., (2014). Cost modelling and simulation of last-mile characteristics in an innovative B2C supply chain environment with implications on urban areas and cities. *Proc. – Soc. Behav. Sci.* 125, 398–411.
- [6] Zhou, L., Baldacci, R., Vigo, D., Wang, X., 2018. A Multi-Depot Two-Echelon vehicle routing problem with delivery options arising in the last mile distribution. *Eur. J. Oper. Res.* 265 (2), 765–778.