

# **Last mile delivery networked**

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## **Abstract**

The 2020 epidemic has put not only the healthcare sector but also the logistics sector in a difficult position. With the growth of e-commerce in the parcel industry, the number of parcels to be shipped has increased exponentially, posing another challenge to the industry, which has been struggling for years. A negligible part of the solutions so far has proposed co-operation on the last mile problem, although perhaps co-operation facing the challenges of the 21st century could be the solution of the future. This paper attempts to present ongoing research aimed at developing a platform-based business model for the parcel industry. Based on the results of a systematic literature review and in-depth interviews with parcel market participants, the research intends to define the new business model using network theory. In the current phase of the research, the development path of the collaborations in the parcel delivery market, the necessary motivating and inhibiting factors, as well as the conflict of interest between the identified actors are presented.

**Keywords:** last mile delivery, networking, co-operation, literature review

**JEL:** L87, L91, M21, O18, P13

## **INTRODUCTION**

The growth of e-commerce in recent years and the change in customer expectations are placing an increasing burden on parcel companies. The biggest challenge in the parcel delivery process is the step of delivering the goods to the customer. According to the literature, the implementation of this process accounts for a significant proportion of the total logistics cost, especially for downtown transportation areas (Olsson et al., 2019). Furthermore, parcel service providers are the cause of increased traffic, congestion, accidents and thus the increasing rate of pollution (Paddeu et al., 2016). City governments are taking decisive action against environmental damage, which is placing additional burdens on parcel delivery companies.

The scientific literature and the logistics profession have known the last mile problem for years, and countless alternative solutions have emerged to alleviate the burden. Solutions include the recommendation of alternative fuel-powered vehicles, the use of distribution optimization models, drones, the expansion of parcel points and parcel lockers, and more recently the involvement of the ordinary people (crowdsourcing) in the delivery process. A negligible part of the proposed solutions suggests cooperation. Although cooperation is a method used in other areas of logistics, it is only accepted in a few cases in parcel delivery. The covid epidemic of 2020 has shown the need to introduce different business models than hitherto known for sustainability and efficiency. The new model should include a network of cooperating parties. The parties need to be mapped out, the interests of the parties need to be examined, and the layers where cooperation between the parties can be considered need to be identified.

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Based on the above, this article presents the details of the research that examines the path leading to the development of cooperation, the motivating and inhibiting factors, identifies the parties and possible conflicts of interest, and finally draws a network of cooperation. If the network cannot be established, it defines the factors that hinder the design and draws the appropriate consequences. From a methodological point of view, the research presents the current situation of parcel delivery through a systematic literature review and identifies the research gap. In addition to the overview, the participants of the Hungarian parcel transport market will be examined through in-depth interviews. Following this, a network of actors is developed and analysed using the methods of network theory. At the current stage of the research, a brief review of the literature is presented, as well as the stages of the development of collaborations, the motivating and inhibiting factors identified so far, and the conflicts of interest. Finally, the network theory to be applied is briefly presented, as well as the questions have already been developed and to be answered along the method.

## 1. LITERATURE REVIEW

According to Bartucz and Süle (2021), e-commerce is on an upward trend and the Covid-19 situation in 2020 predicts even more intense growth for the coming years. Hagen and Scheel-Kopeinig (2021) point out that the sector increased by 35% from 2010 to 2020. In addition to growth, customer expectations have also been changed. Increased transportation demands and rising customer expectations are putting pressure on last mile providers. Paddeu et al. (2016) highlight that global urbanization requires greater transportation, which has an impact on social, environmental and economic conditions Olsson et al. (2019) argue that last mile delivery is the largest cost factor in logistics transportation and moreover, Halldórsson and Wehner (2020) state it is the most energy intensive operations; therefore, suppliers are almost forced to reduce transport costs while reducing social, environmental and economic impacts.

The scientific literature has been dealing with the last mile problem for years. Over the past 15 years, thousands of solution alternatives have emerged that can be basically divided into 4 groups. Bartucz and Süle (2021) argue that the first group of the recommended alternatives includes innovative technologies and sustainable vehicles (Allen et al., 2017; Bandeira et al., 2019; Chiang et al., 2019; Dai–Chen, 2011; McLeod et al., 2020; Moroz–Polkowski, 2016; 2020; Pardo-Bosch et al., 2021; Oliveira et al., 2017). The second group mainly encompasses optimization solutions (Allen et al., 2017; Dahl–Derigs, 2011; Limoubpratum et al., 2015; Park et al., 2016). The third group of solutions explored focuses on logistics structures including urban city models (Hagen–Scheel-Kopeinig, 2021; Melkonyan et al., 2020; Montwill et al., 2021; Park et al., 2016; Pourrahmani–Jaller, 2021; Serrano-Hernandez et al., 2018) and the fourth category deals with regulatory systems (Park et al., 2016).

The cooperation recommendation belongs to the third group. The concept of cooperation is not unknown in the logistics industry in the broadest sense. Gonzalez-Féliu et al. (2018) highlights that this industry has a myriad of strategic alliances to improve efficiency or to achieve more resources. Despite all this, parcel delivery is not characterized by the establishment of alliances or cooperation. Yet there are examples to follow in the world. McLeod et al. (2020) draws attention to the fact that the carrier's carrier type relationship has been operating successfully in Scotland for years. The collaboration of four-wheeled and two-wheeled courier companies is also successful when it comes to covering a special area. As urbanization intensifies, the importance of Urban City Centres (UCCs) increases. According to Paddeu et al. (2016) and Park et al. (2016), the role of UCCs could be increased significantly in the coming years if UCCs can be attractive to parcel carriers with their efficient operation and attractiveness. Nevertheless, Bengsston et al. (2000) point out that although collaboration

is a possible solution to long-standing problems, providers are uncertain about how to establish a reliable and fruitful collaboration. Although the possibility of cooperation can promise success, it is worth examining the factors that hinder it as well as analyse why the sector does not collaborate.

Following a brief review of the literature, this article summarizes the history of the development of cooperation and provides an overview of the motivating and inhibiting factors. In addition, it presents the actors defined so far in the research and the conflict of interest between them. Finally, it provides a brief overview of network theory and the method applicable to research.

## **2. DISCUSSION**

According to Cheong et al. (2016, 1) “in the modern world, the concept that “business is war” is becoming outdated.” Although each of the service providers is fighting for the largest number of packages per day and with it the largest market share, in certain circumstances it is advisable to choose cooperation instead of war. In the following, the paths leading to the development of cooperation and the necessary motivating and inhibiting factors are presented.

### **2.1. DEVELOPMENT PATH OF COLLABORATION AND ITS MOTIVATING AND INHIBITING FACTORS**

#### ***2.1.1. SUBCONTRACTOR INVOLVEMENT***

Parcel delivery is characterized by the use of own resources. However, buying more and more resources requires constant investment. If the service provider does not wish to invest further resources, it will use the involvement of a subcontractor. This is the first step in the collaboration, which we call subcontracting in the present study. The basic motivating factor for this form of cooperation is the economic interest in order to provide the entrepreneur with additional resources. Involving a subcontractor carries minimal risk, and building trust between the subcontractor and the main contractor is essential for initial cooperation. The main contractor retains its own brand, the subcontractor does not disclose its own brand during the cooperation. The main contractor shares information with the subcontractor, which meaningfully increases his risk. This form of cooperation is a method used in the parcel industry, although the parties remain in a subordinate relationship (vertical).

#### ***2.1.2. COLLABORATION – COMPLEMENTARY SERVICE***

As shown in Table 1, the next phase of collaboration is already a more advanced level of collaboration called complement. The initiator lacks a certain type of service in-house, it cooperates with an actor who has this competence (e.g., 4-wheeled and 2-wheeled service providers). In parcel delivery, the actors cooperating is on a side-by-side level (horizontal), presumably serving the same areas or customer base. The motivating factor for cooperation is economic interest. At this stage, a more serious degree of risk-taking is required, as the actor involved is in the same market as the initiator of the cooperation. If cooperation promises to be beneficial to the parties, there are no additional impediments other than the need for trust. Examples of complementary collaboration are the co-operation between GLS in Hungary and Hajtás Pajtás (2-wheeled) to cover downtown areas, and the co-operation between the Dutch DPD and Fietskoeriers (2-wheeled).

Table 1 The development path of collaboration

Form	Motivating factor	Coercive factor	Trust	Risk taking
<b>Subco involvement</b>	Economic interest	Lack of capital for additional resources	Needed	Limited
<b>Collaboration - complementary service</b>	Economic interest	Missing competence	Needed	High
<b>Alliance/Coalition</b>	Economic interest, access to additional resources	No	Highly required	High
<b>UCC</b>	Economic interest if the UCC is attractive	Regulations	Needed	High
<b>Platform-based model</b>	Economic interest access to additional resources and services	Regulations	Needed	High

Source: author's own work

### 2.1.3 STRATEGIC ALLIANCE

In the face of constant market competition, business leaders are regularly confronted with the strategic dilemma of how they can take a huge step forward economically. High levels of economic growth are possible through serious investment or the formation of a strategic alliance. Strategic alliances are known in the world of airlines, where the members of the alliance receive remuneration and additional resources for a fee. The driving force behind the formation of this formation is also economic interest, yet the ability to access and use additional, often unavailable resources. At this level of cooperation, both risk-taking skills and trust in alliance members are high. As early as 1999, the literature developed a definition describing this type of cooperation: cooptation, i.e., cooperation and competition between the parties at the same time (Bengtsson–Kock, 1999).

### 2.1.4. URBAN CITY CENTRES (UCC)

The intensification of urbanization, and at the same time the increase in the level of environmental pollution, has forced city leaders to find a solution. Attempts were made to mitigate the environmental damage by setting up urban logistics centres, at the same time as the next stage of the cooperative development path was born. With the construction of UCCs, a new player also appeared in the parcel market. UCCs are usually located close to cities and their basic goal is to reduce the volume of goods to and from the city. Typically, UCCs are set up by city management and then operated by a third party. In addition to the motivating factors known so far, a so-called coercive factor appears in the case of joining the UCC. In return for the structure of the UCC, the city administration almost obliges the service providers to join in order to reduce the level of environmental pollution. Of the nearly 200 UCCs established in the last 25 years, very few still operate today. Forcing UCCs to succeed is not enough to apply coercion. Joining the UCC should be made attractive to service providers. The basic motivator of this form of cooperation is coercion, although joining a sufficiently attractive UCC can also take place along economic interests. In the case of coercion, the trust factor is low, although cooperation with such a new formation presupposes serious trust.

### *2.1.5. PLATFORM-BASED COLLABORATION*

The last level of collaboration shown in Table 1 is called the platform-based business model. The platform-based model works successfully in the service industry used by ordinary people (e.g., Airbnb, Blablacar, Uber, etc.). The question is whether this success can be transformed into the logistics industry. In terms of motivating factors, the platform-based services used by ordinary people assume a hitherto unknown level of trust. Can even a small part of this trust be transferred to the business world? A platform-based operation also presupposes information sharing, which is one of the most feared treasures of companies. In the course of the research, it is necessary to know the conditions under which the actors would join the platform.

In addition to the motivating factors, the obstacles to cooperation should also be mentioned. Parcel companies are afraid of their brand, the market share they have gained, their customer database and the information they have accumulated over the years. In a collaboration, they may need to outsource or use resources and pass on information to another party along with all of this. The operation known so far, or a phase of it, will be transformed for the new co-operation model. Although the co-operating parties are aware of the economic benefits of their new model, trust is built over a long period of time while constantly taking risks.

Bengsston et al. (2000) drew attention to the fact that while collaboration can be a good decision, because of its complexity, companies do not know how to embark on it. As many collaborations, there are so many types of models. What motivated or inhibited the parties at the beginning of the cooperation can only be answered on the basis of an individual examination. The basic motivating factor is expected to be economic interest, or combined with a coercive force. The question is how much trust, risk-taking has an effect on the development of cooperation. What is the role of IT trust in preventing a collaboration (in the case of a platform-based business model)?

The main goal of the present research is to develop a new type of business model that meets the challenges of the 21st century in the industry and carries the hallmarks of a sharing economy. The new model assumes the cooperation of the participants and connects certain levels of their operation.

## **2.2. THE CONFLICTING INTEREST**

The three players in the parcel industry identified so far in the research are the customer, the courier company and the city management. The interests of the three actors are conflicting. What is advantageous to one is disadvantageous to the other, or to the other two. Table 2 summarizes the expectations of the actors and its impact on the other two actors. Increasing customer expectations, the need for shorter time windows, requesting home delivery, or looking for a cheaper provider is against the interests of the parcel carrier. The parcel carrier would like a longer delivery time, delivering instead of home delivery to a parcel terminal or partner point, and after a while he will not be able to further reduce his costs. Such needs of the customer are also disadvantageous for the city management, as there will be more trucks on the roads, increasing traffic and pollution. The response of the city management to reduce traffic (closures) is favourable for the buyer because it can travel more comfortably, the air will be better. At the same time, it is another burden for the parcel carrier to bear and find a solution. The actions taken by the parcel carrier to meet its expectations are favourable to the customer, but in some cases unfavourable to the city administration.

Table 2 The conflicting interest of the parties of last mile delivery

	Effect of the requirements	
Consumer	Last mile service provider	City government
Receive ordered goods according to his preferences	problem	more vans on the road
Require short delivery time	problem	more vans on the road
Require cheaper provider	problem	no effect
Require mainly home delivery (mostly)	problem	more vans on the road
	Effect of the requirements	
Last mile service provider	Consumer	City government
Deliver the goods on time to the consumer	good	more vans on the road, bigger traffic
Require effective distribution	good	no effect
Require effective delivery	good	more vans on the road, bigger traffic
Decrease cost	good	no direct effect
Make customer satisfied	good	no direct effect
Have brand reputation	good	no effect
Increase market share	no effect	no effect
	Effect of the requirements	
City government	Consumer	Last mile service provider
Decrease traffic congestion (road closures)	good	problem
Decrease traffic accidents (transportation restrictions)	good	problem
Decrease pollution and environmental damage (closures, high parking costs, restrictions)	good	problem
Make cities liveable	good	problem

Source: author's own work

Although the interests of the actors are in conflict with each other, by building an appropriate business model and introducing regulation, the extent of the conflict can be reduced. In addition to the three actors identified so far in the research, there are likely to be others who may have an impact on the industry and individual actors. Identifying these actors and examining their relationship with other actors is essential for the research.

### **2.3. NETWORKING IN LAST MILE DELIVERY**

Parcel delivery actors have some level of relationship with each other that presumably outlines a network. A defining part of the present research is the definition of the parcel delivery network. Network theory has been successfully applied in the study of the peculiarities of the Internet (Faloutsos et al., 1999), in the study of cell metabolism (Ravasz et al., 2002), the World Wide Web (Barabási et al., 2000), in the study of scientific collaborations (Barabási et al., 2002) and in the sharing economy (Soltész–Zilahy, 2019).

Mapping the actors of the parcel delivery network and defining the connections will help to understand the nature and behaviour of the whole network (Bartucz et al., 2021). Once the network of each actor has been built, it will be possible to understand the relationships with others, from which the vision of the network to be established can be deduced. Once the network is understood, it becomes possible to define the characteristics and the pattern of the whole network can be inferred from the properties of the whole network.

The change in recent years, from both a customer and city management perspective, is almost asking parcel service providers to work together. The importance of city governments is growing, their role is strengthening in the daily lives of parcel carriers. The network-based approach is important since, on the one hand, it explores the hitherto unknown inner world of last mile actors and, on the other hand, allows it to use its results to provide an alternative to a platform-based operation.

## **3. CONCLUSIONS**

This article presents the findings of an ongoing research. The aim of the research is to create an operational model that helps companies with a last mile problem. In recent decades, numerous solutions have been proposed to the last mile problem, but only in a negligible case was cooperation a possible solution.

In the present study, the development path of the collaborations in the parcel transport market is presented, as well as the motivating and inhibiting factors existing at each station are analysed. It was found that economic interest is a fundamental motivating factor for collaborations. However, co-operation may also take place under the influence of some coercion. However, companies fear losing their own brand, customer base and information, so these are the main barriers to collaboration.

Three players in the parcel market have been identified in the current phase of the research: the customer, the courier companies and the city management. The parties were found to have a conflict of interest. The growing demand of one party has an adverse effect on the other or the other two parties.

The players in the parcel market are in some kind of network with each other. In the next phase of the research, it will be examined whether there are other actors in this network. What impact are possible additional actors on the others? Which of the characteristics defined by network theory is borne by the parcel delivery network itself? What impact do possible additional actors have on others? Which of the characteristics defined by network theory is carried by the parcel delivery network itself? Can the behaviour of the parcel network be inferred from the network characteristics? Are the motivating and inhibiting factors learned so far sufficient to determine the characteristics of the platform-based model? Would the new model to be developed make parcel delivery more efficient? Are the motivating and inhibiting factors known so far changing in the network relationship system? The main goal of the research is to understand the network in order to define the factors on the basis of which connection to the platform is beneficial for the parties.

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