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On the Potentials and Dilemmas of Cooperative/White-Label Deliveries based on Selected Austrian Demonstration Cases

Matthias Prandtstetter[1], Benjamin Biesinger[1], Bin Hu[1], Pamela Nolz[1], Martin Reinthaler[1], Jürgen Zajicek[1], Alessandra Angelini[2], Georg Hauger[2], Matthias Steinbauer[3], Johannes Braith[4], Reinhold Schodl[5], Sandra Eitler[5]

1. AIT Austrian Institute of Technology, Vienna, Austria
2. Technische Universität Wien, Center of Transportation System Planning, Vienna, Austria
3. Variocube GmbH, Linz, Austria
4. StoreMe GmbH, Vienna, Austria
5. Fachhochschule des bfi Wien, Vienna, Austria

Corresponding author: matthias.prandtstetter@ait.ac.at

Abstract: *One of the main pillars of the Physical Internet (PI) is cooperation. One possible form of cooperation in freight transportation is bundling. As soon as bundling is in focus, we have to think about locations where this bundling might take place, which are, normally, hubs. So, the main idea would be that different freight carriers meet at a specific hub and exchange their freight according to some (clever) planning such that redundancies in trips are overcome. E.g., instead of two carriers serving regions A and B, they cooperate such that the first carrier only has to serve region A and the other one only has to serve area B. Even though the general idea is quite clear, details are sometimes more complicated. In this paper, potentials and dilemmas related to cooperative delivery models based on the observations made in selected Austrian case studies are outlined.*

Keywords: *white-label deliveries, cooperation, hub, parcel distribution, parcel lockers*

1 Introduction

The main concepts of the *Physical Internet* (PI) (Montreuil, 2011) are easy to understand: cooperate and collaborate. However, there are many pitfalls to overcome in order to establish "the" PI. As recent efforts show (cf. contributions to the IPIC conference series) extensive research has been carried out specifically aimed at contributing to the realization of the PI in the transport system. However, there are a lot more works which are not specifically targeting at the PI itself but at concepts and developments which are building the basis of the PI considering the transportation network, cf. Markvica (2019). Not so obvious, but nevertheless important, work "at the basis" is provided when having closer looks at the organization of transportation and logistical processes, cf., among others, Veeraraghavan and Scheller-Wolf (2008), Pérez Rivera and Mes (2016). Finally, there are even some best practices (e.g., the ETC Gateway Services or Brabant Intermodal Joint Venture) which are demonstrating the potential of the PI in real-world settings, cf. Putz and Prandtstetter (2015). Nevertheless, "the" PI is not yet applied on a large scale.

The contribution of this paper is twofold: On the one hand, the paper presents four selected Austrian demonstration cases of developments in the logistics sector which are fully in-line with the PI concepts (although they are not targeted to be PI developments). On the other hand, potentials and dilemmas are extracted as observed at exactly these four presented best practice examples.

The remainder of the paper is organized as follows: In the next section, we will shortly outline the four selected Austrian research and application projects building the basis of this study. Then, some cooperation models in the freight transportation sector will be explained, including the currently hot-topic of white-label distribution. In Section 4, the potential of the presented cooperation models will be discussed while Section 5 will focus on the dilemmas associated therewith. Section 6 will summarize the paper with conclusions.

2 Selected Austrian Demonstration Cases

The work presented herein is based on the observations and conclusions drawn in the four Austrian research and application projects EMILIA, GrazLog, KoopHubs and alBOX. In the following, we will present the four main contributing projects in more detail.

2.1 EMILIA

The EMILA (Electric Mobility for Innovative freight Logistics In Austria) project mainly focused on the integration of electric vehicles into logistics operations. The main application areas were a) parcel delivery and b) distribution of goods from groceries. In the field of parcel deliveries, the main focus was laid on establishing a city hub which is fed by a large(r) (conventional) truck and which was used as a distribution base for (cargo) bike logistics. The distribution of groceries mainly focused on a dynamic distribution concept where customers are guaranteed to receive their last-minute order within the next X minutes.

In the city hub scenario, the main challenge was to solve a classical vehicle routing problem, i.e., which parcel to deliver along which tour in which order. However, additionally, a two-echelon problem was required to be solved since in some cases a direct distribution of some parcels by the trucks serving the city hub might be more efficient (e.g. because of less cargo handling). Furthermore, the parcel deliveries of the trucks to the city hub (for further fine distribution by the cargo bikes) need to be synchronized with the cargo bikes as the storage space at the city hub is (strongly) limited (Nolz et al., 2018). The city hub of the EMILIA project has been established in 2016 and successfully operated by DPD throughout the project runtime (and beyond), cf. Nolz et al. (2017), Nolz et al. (2018).

The use case focusing on the deliveries of goods from groceries was different in that sense that most of the orders were known in advance by the groceries. However, some last-minute orders had to be fulfilled within the next X minutes. This implies that pre-planned tours had to be dynamically adapted. Contrary to the parcel deliveries, the groceries could be picked-up at any cooperating store meaning that maybe only small detours are necessary (Nolz et al., 2017).

2.2 GrazLog

The GrazLog project focuses on the implementation of a common consolidation center for all deliveries towards the inner city of Graz, Austria. The main idea is to apply bundling on the very last mile such that only a limited number of (parcel) carriers has to enter the pedestrian zones. In particular, this means that all delivery services are redirected towards the consolidation center where all parcels are collected and resorted such that finally only dedicated vehicles enter the pedestrian zones at specific times. Due to the applied bundling, the number of vehicles entering the pedestrian zones can be reduced. In addition, the first delivery rate can be significantly increased since on the inbound site of the consolidation center the opening hours are kept quite generous (e.g. 7am-7pm). On the outbound site, delivery tours are planned according to the time windows specified by the recipients. Due to the (relatively) small area to be served by the consolidation center direct communication with the recipients is possible.

2.3 KoopHubs

In contrast to the GrazLog and EMILIA projects, the KoopHubs project is focusing more on the social potential of a city hub. Instead of providing a consolidation center solely, the city hub concept is extended in that sense that additional services (e.g., coffee shop, workshop, exchange platform, etc.) are offered at the city hub. These additional services shall convert the pure logistical atmosphere of the city hub towards a social meeting point.

2.4 alBOX

The alBOX project is giving prior attention on the parcel delivery and logistical processes within the parcel distribution. The main idea is to implement white-label pick-up station/parcel lockers in urban and rural areas using this infrastructure as delivery points for all parcel services. Costumer can receive their parcel from the parcel locker. Obviously, the mentioned pick-up stations have to be equipped with the corresponding technologies which are mainly tamper-proof lockers and a terminal for un/locking the depositing boxes.

Within this project, two pick-up stations are installed: one parcel locker in an apartment building in the densely populated 5th district of Vienna (AUT), the other one at the public town square in a small village on the Austrian countryside. During the usability check (acceptance study) and in a continuous dialogue-process data is generated. Based on the received data, customized services are provided (e.g. cross-selling, use of the parcel locker for sharing activity within the community) and the efficient flow of goods, services and information is designed.

The main focus of alBOX is laid on investigating how the acceptance by the users (costumer, parcel services etc.) differs and which business models are profitable and accepted by the different user groups.

3 Cooperation Models

As already outline in the Introduction, cooperation is one of the key concepts of the PI. Of course, cooperation has also to be applied in the context of last-mile deliveries. In this context, we distinguish mainly two cooperation areas: The first one is related to the actual last-mile transport while the second one is related to the transshipment.

3.1 Cooperative Distribution

It is well known, that in parcel logistics the (very) last-mile is the actual expensive part of the transport chain (Boyer et al., 2011). This is, among others, reasoned in the fact that bundling effects are not so large for last-mile deliveries. Even more, the efficiency is heavily dependent on the density of the customers (Boyer et al., 2011). Therefore, one goal should be to increase customer density along the last-mile. This can be achieved through cooperation and collaboration.

- **parallel distribution**
  In the parallel distribution setup, the main concept is that two (or more) carriers are using a hub as interchange point of e.g. parcels (or goods in general). At the hub, they

exchange parcels such that each carrier increases the customer density along his tour(s). This is basically achieved by the idea that the original (large) area is split into two and one supplier is serving all customers (from both suppliers) in the first area while the second supplier serves all other customers (from both suppliers) in the other area. The main challenge with this setup is to find the optimal split of the large area.

- **singular distribution**
  In the singular distribution setup, all carriers bring their goods to the hub but only one carrier is then delivering all goods in the whole area. Obviously, the customer density is increased along the last-mile delivery and therefore efficiency is increased too. However, the supplier servicing this area must provide enough capacity. Further, all suppliers delivering only to the hub have to pay for the last-mile delivery.
- **white-label distribution**
  In white-label distribution, the setup is quite similar to singular distribution but the last mile, i.e. the deliveries after consolidating at the hub, are done by a third-party provider, i.e. a company which is none of the freight carriers delivering parcels to the hub (e.g. municipal services). The charming part of this cooperation model is that competition among parcel suppliers is still fair since positive marketing effects (e.g. through labeled cars driving around) are not existent for all operators. The white-label service might be paid by the original suppliers, by the recipient and/or by the municipality (or other public bodies).

Although many variations of cooperation models can be classified according to these three main classes, it is also necessary to talk about the cooperation model with respect to the hub/consolidation center itself:

- **cooperative hub**
  The hub could be operated by all utilizing freight carriers. Costs have to be shared accordingly. Obviously, this setup is, however, the most challenging one as decision making has to be achieved via compromises and therefore (a lot of) negotiations.
- **single-operator hub**
  In this model, only one of the freight carriers is operating the hub while all others are just “customers” to the hub. This setup will be very likely chosen in combination with the singular distribution setup. Like the singular distribution setup, the other suppliers have to pay for the services and the provided infrastructure.
- **white-label hub**
  In the white-label hub setup, the hub is operated by a third-party provider and all freight carriers are customer to it.

Note, that even though some combinations of hub and distribution setups are common in practice (e.g. singular hub and singular distribution; white-label hub and white-label distribution), any combination of cooperation models is possible.

4 Potentials

When coming to the point of potentials, it can be stated that cooperation always is related to (new) opportunities and therefore high potentials are involved. However, to be more precise, let us investigate a small thought experiment: Under the assumption that two carriers cooperate for the very last mile in an area. Let us further assume that both carriers have

B. Obviously, both carriers have benefits as the customer density is significantly increased leading to more stops in less time/distance and therefore a higher (monetary) benefit. High cost-effectiveness is further achieved by the decrease of transport and handling time as well as time-efficient planning of overall resources (personal, vehicles, infrastructure). That is, from a pure business economic view, we are facing a win-win situation. However, and we think that the real potential is contained herein, we have to consider the macroeconomic view as well.

As already stated, for both carriers the distance traveled is significantly reduced which can be directly transferred into an estimation of greenhouse gas emission reductions (under the assumption that conventional delivery vehicles are incorporated). Furthermore, the number of vehicles on the road (and of course also searching for parking spots) is reduced which has a positive effect on the transportation system (high level of service) as well as the livability in the region, too. In addition, one has to keep in mind that due to the increased customer density especially economical unviable regions such as rural areas are becoming more interesting for parcel suppliers leading (on a long term) to improve service quality and gain high vehicle utilization.

To sum this up, we conclude that cooperation in (very) last-mile delivery leads to a win-win-win situation and – from this point of view – should be fostered.

5 Dilemmas

Although the benefits gathered through bundling as explained in the previous section are enormous, one has to keep in mind that there are also some drawbacks and challenges related with cooperative and especially white-label logistics. In the following, we list experiences and observations obtained in various research projects:

- Especially in case of parcel distribution, we made the experience that (almost) all carriers are willing to deliver parcels of other carriers (if the service is paid). However, the willingness to give its own parcels for services with another carrier is rather low. The main reason mentioned is that service quality cannot be guaranteed. Complaints are, however, not stated towards the delivering carrier but to the original carrier instructed by the shipper.
- Service quality as negotiated with the customers (the actual senders of the parcels) cannot be guaranteed unless a strong legal contractual set of agreements has been agreed on. However, this set of agreements has to be negotiated on a bilateral basis among all cooperating carriers. Obviously, this might be quite challenging.
- A further aspect related with cooperative services is the transfer of liability. Obviously, it is necessary to document all transfers on a full basis. Especially in case of damages or losses it is essential to trace the causer. Nevertheless, it is very likely that the primary carrier (which is the contract partner of the shipper) is associated with the loss. This bad image was already discussed in the first point.
- Analogously, complaints related to the service (e.g. lateness, damage, etc.) will most probably addressed to the primary freight carrier and not to the last-mile distributor. Full tracking and tracing is necessary to identify the responsible carrier for the actual degraded service.
- The freight carriers (or at least some of them) are not (or only reduced) visible on the road (due to long haul services only) which leads to a decreased marketing. This might lead to additional costs with respect to advertising.

- Whenever cooperation of competing companies is part of a business model the question arises whether price agreements are undertaken which, obviously, have negative effects on the final customer (e.g. the price is increased, or the service quality is decreased). Therefore, the competition authority has to approve the cooperation(s). Due to current rapid developments in the parcel service market, it is very likely that many and maybe long-lasting examinations and evaluations have to be performed.
- Complex optimization approaches are necessary in order to make sure that equity and fairness among the freight carriers is given. This is especially the case, when the distribution among the cooperating carriers is not obvious, e.g., one area with high demand and another area with low demand.
- In case of business models where the hub might be used as a final deposit address (and the end customer has to pick-up the parcel at the hub personally), it is not sure that the positive effect of reduction of greenhouse gas emissions is still given. Although the first delivery rate can be significantly increased (to the maximum of 100% if all parcels are delivered to the pick-up station only), all recipients have to drive to the pick-up station in the worst case. This results in a hub-and-spoke-like approach which finally leads to more greenhouse gas emissions than a classical delivery tour. However, we have to keep in mind that for those recipients where the first delivery would have not been successful, the greenhouse gas emissions are reduced. More detailed examinations with respect to this (potential) impact will be carried out throughout further experiments in the alBOX project.

6 Conclusions

As outlined above, there are potentials but also challenges of cooperative and especially white-label distribution concepts. The final question is, however, whether the opportunities and potentials are higher than the risks and drawbacks. As two of the four mentioned projects are going to apply the discussed cooperative delivery models in real-world settings, we expect to get valuable input data on that topic for further investigation. As a first estimation, we have to state that most of the dilemmas mentioned are related to topics like trust, legal framework and distortion of competition (especially towards medium and small carriers).

With respect to (forbidden) market arrangements, one has to access, however, the ratio of additional costs (e.g. due to (quasi) monopoly positions) over saved costs (e.g. due to positive bundling effects). If this ratio is below 1, i.e. the savings are higher than the extra costs, the overall impact would still be positive. Especially due to the climatic situation of our planet and the need to meet the climate goals as agreed on in various global climate conferences, one has to think twice whether even a ration above 1 is a show-stopper.

Finally, we want to highlight that the proposed concept of cooperative (very) last-mile deliveries is a win-win-win situation, i.e. all cooperating carriers (cost and time saving) as well as customers (added value) and environment (reduction of greenhouse gas emissions) are experiencing positive effects. Nevertheless, one big question still remains upright, which is “Why is the willingness to cooperate so low?”. Although we have no answer to this question, we think that the main challenge (for cooperative deliveries as well as the PI as a whole) is trust among competing companies. Therefore, we think that further work related on “how to overcome confidence issues” is of high importance and the PI community should intensify efforts to drive forwards on this topic within the next years.

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