Collaborative City Logistics in hyperconnected delivery networks

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Abstract: *Supply chains with rather small volumes in a disperse network are rather fragmented. City logistics is an example, where Physical Internet is a real game changer in this type of business. Binnenstadservice Nederland B.V. is an advanced operator of a network of city hubs in the Netherlands. What has been missing is an IT tool which enables collaboration between involved stakeholders. Therefor the SaaS MixMoveMatch from MARLO has been implemented in 2016 to proceed fast planning of consolidation of shipments in the city hubs as well as the routing and delivery in the city distribution. MixMoveMatch also controls the various processes in the cross docking. Through easy to install standard interfaces data can be imported from the various suppliers and carriers who feed cargo into the hub. The operation in the hub and at the last mile can be done with only one solution and its device substituting the confusing variety of systems to be handled previously. Existing TMS and WMS can remain which keeps new investments to an absolute minimum. This approach enables in an economically feasible way a level of visibility and high quality distribution which hardly existed until now for small volumes of parcel shipments.*

Keywords: *city logistics, collaboration, last mile, consolidation, parcel delivery, return logistics*

1 Introduction

Nowadays 40% of the transport costs are in the last miles. City logistics is 30% of the freight volume, but causes 70% of the traffic congestions in the cities. A drastic growth of delivery addresses and much higher frequency of smaller deliveries is to be foreseen by the expanding e-commerce business. Changes in distribution channels in the direction of platforms and portals lead to small scale logistics services that are individualized for customers. [Kersten et al.]. Consequently, the impact of delivery vehicles will increase, notable their emissions and omnipresence all over the day. Technical measures as electric vehicles are not sufficient to solve the problem. The solution must start at the root cause, the organisation of the supply chain. Digitalization of business processes and transparency in the supply chain are the most important trends [Kersten et al.]. Also an enabler for collaboration is needed.

This innovation paper presents an approach which has been developed by Binnenstadservice Nederland and MARLO to improve the impact of city logistics in a much more competitive and sustainable way.

The implementation has gone even a step further beyond the city hubs as all stakeholders from shipper, long distance hub and carrier as well as city logistics hubs and last mile delivery could be involved in the same application. At the first time, each stakeholder is now able to check only his relevant data at any time. Notably the shipper gains an overview on the distribution of his products throughout the network of all city hubs until proof of delivery at shops and customers. Usage of capacities at long distance and at the last mile are increased as the systems works on parcel rather than pallet level. Short-term changes due to ad-hoc

demand or incidents can be made through an update of the planning. Increase of volume and additional stakeholders can be covered due to the modular scalability of the solution. Urban logistics hubs and consolidated distribution becomes much more attractive as they can much better be integrated both in a synchronised physical and information flow throughout their network. Delivery to multiple cities becomes transparent.

2 Objectives

The overall objective is to optimise the inefficient small-volume flows of goods in cities. This is done by neutral smart city hubs that coordinate and consolidate the flows. Nevertheless, the existing smart city hubs are struggling with the same challenge: how to get more volume to make a significant impact in cities and at the same time make their business economically more sustainable? If this efficiency improvements can be achieved the likelihood of the establishment of further smart city hubs in much more cities all over Europe will be increased substantially.

3 New approach to city logistics

The 'Triple X and Triple P' solution is a novel integrated approach to make Smart City Hubs work for the cities and create the impact that is needed. The approach is working in parallel both on the private and on the public side. At the same time, it works in parallel both upstream and downstream in the supply chain. This new approach is born out of experience in city logistics. New smart city hubs will be involved by simultaneously working on involving new shippers, connecting the local governments and connecting the hubs to the IT platform.

3.1 Structure of Triple X

Every city above 100.000 inhabitants needs a local independent smart city hub of at least 1000 m². Smaller cities may bundle their volume in common smart city hub of which delivery tours cover one or several of these small cities. The three main pillars of the value proposition concern the physical, financial and IT level of coordination and connectivity at a smart city hub implemented by the private service provider.

3.1.1 Physical cross-dock

The physical cross-dock is an integrated network of innovative smart city hubs. These hubs consist on the one hand of the physical infrastructure as warehouses and hub buildings as well as devices required to handle and move the shipments (sorting facility, forklift truck, scanner, rack storage etc.). All hubs should be connected in the Smart City Hubs Europe network not only for the purpose of cooperation in marketing and sales but also to provide a uniform service in distribution and value added logistics which improve their competitiveness significantly.

3.1.2 Financial cross-dock

The financial cross-dock is an attractive financial value proposition for all stakeholders involved in the city logistics supply chain. It ensures that all stakeholders profit from a win-win situation. The possibilities for bundling of deliveries creates lower price per delivery stop. End receivers should be able to ask for a city logistic Incoterm, creating a better fit with their demands.

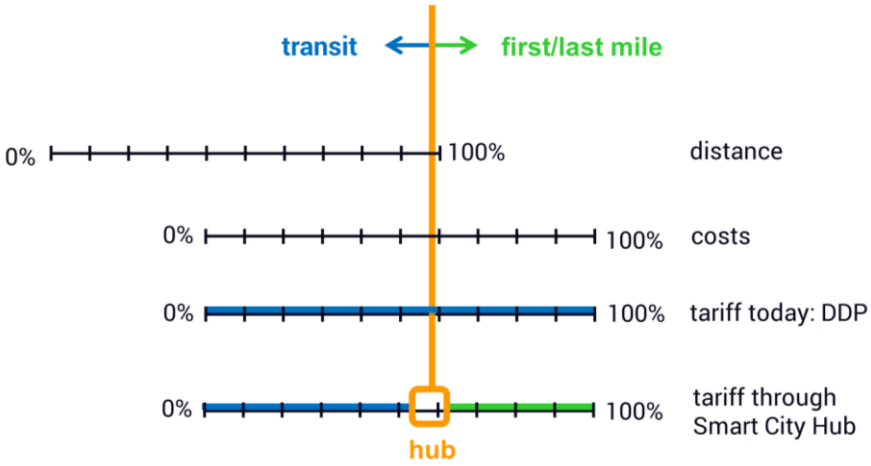

Figure 1: costs and tariff today and with Smart City Hub

3.1.3 IT cross-dock

The IT cross-dock is a software services to ensure seamless and integrated processes across the network supply chain. The leading IT platform which provides the required features is MixMoveMatch.com. This solution provided a layer of collaborative intelligence over the supply chain that would take decisions in real-time to optimise cost and performance.

3.2 Structure of Triple P

The governments have to create the trigger for the industry stakeholders to change their logistic behavior, 'the triple P for municipalities'. The three main pillars of the complementary supportive activities on the public administration and policy side are policy on sustainable logistics, procurement and promotion level.

3.2.1 Policy on sustainable logistics

The municipal council can make a significant contribution by shaping an adequate framework in terms of an explicit sustainable urban logistics policy. A main driver are the ambitions towards a reduction of the impact of logistics activities on inhabitants. This can be achieved by zero-emission logistics regarding noise and exhaust. Furthermore, the duration of the presence as well as the frequency of delivery trucks in sensitive city areas (residential or pedestrian areas) can be reduced significantly.

3.2.2 Public procurement

City governments can use their purchase-power to make their own supplies zero emission and energy neutral. The benchmark for the evaluation is not only the lowest price which counts, but especially environmental impact due to the applicable sustainable urban logistics policy is highly relevant. Tenderers who make use of environmentally sustainable goods and supply are evaluated higher.

3.2.3 Promotion and publicity

City governments can promote the solution while at the same time maintaining the level playing field that is needed to balance interests. The alderman can play her/his symbolic role by providing opening acts and doing presentations at conferences. The local government can use social media to seek publicity for the solution thru various channels (e.g. twitter, Instagram, apply for awards etc.). The city government already knows the local logistics community very well and by being a neutral public body itself it is easy for them to approach and convince potential partners. City government may also give the floor to the solution on conferences, and workshops. Finally, the city government may also coordinate on a national

or even better on an international level through city associations working as a coordinator and multiplicator. The city government already experienced with their city logistics approach can inform and convince other city governments about their solution. The cities can support city logistics solutions significantly by coordinating between each other so that their solutions provide similar service or in the best-case act together at the market.

4 Best practice case Netherlands

Binnenstadservice had started its operations in 2008 in Nijmegen and s´Hertogenbosch with start financing by the Dutch state. Since than more and more small and big retailers are served so that operations could grow gradually and into profitability. The ambition is to create 24 hubs serving 40 cities in the Netherlands. To achiev this goal, it became obvious that further measures needed to be undertaken to make the operations more efficient and the usage for the customers and stakeholders much easier. That is why MARLO get involved in 2016 to improve planning, information management and exchange significantly by applying its cloud-based supply chain management software MixMoveMatch.

4.1 Network configuration

The 9 smart city hubs branded Goederenhub in the Netherland, initially at Nijmegen and Maastricht, do work as consolidation centers for various shippers, logistics service providers and couriers. Previously they all deliver their shipments into the city hubs avoiding their own time consuming and therefor costly delivery tour within the city. Doing so they can increase the efficiency of their line hauls. For the consignees, mainly retailers, value added services as buffering or return logistics can be offered by the city hub operator. Therefore, commercial contracts have been signed between Binnenstadservice Nederland and the consignees.

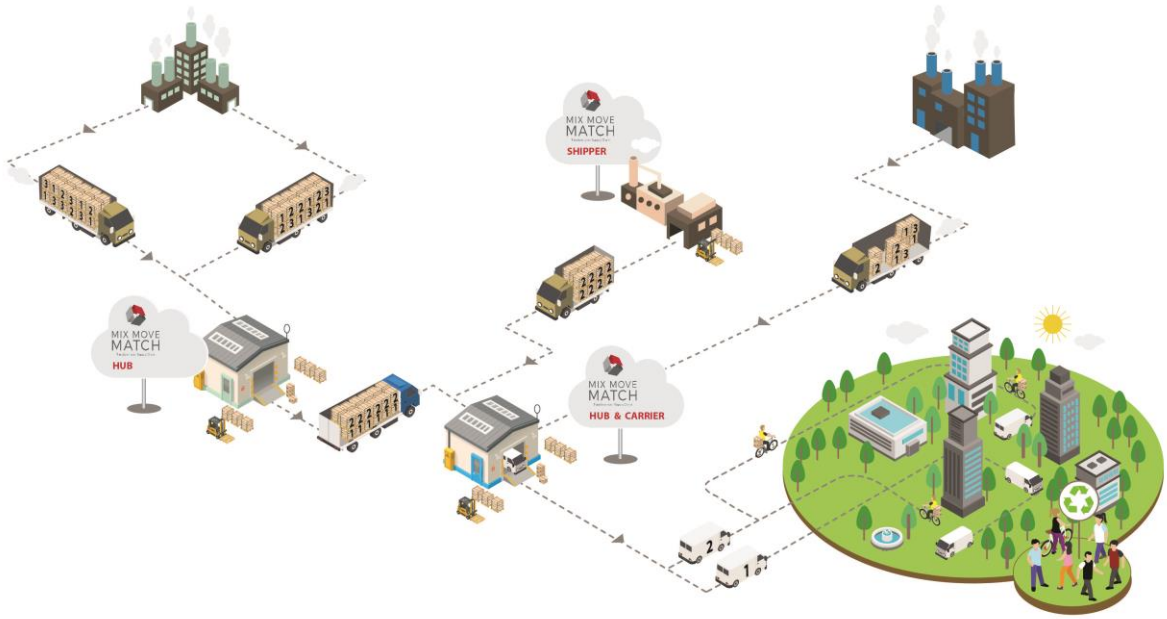

Figure 2: Full smart city hub distribution network

4.2 IT solution MixMoveMatch

MixMoveMatch.com provided a layer of network collaboration that filled in the integration and collaboration gaps. It enables a seamless integration with all kind of services along the supply chain. At the same time full control and visibility over the handling and delivery

process can be gained. MixMoveMatch is based on a holistic approach for supply chain management on parcel level, even so it does consist of three portals dedicated to shippers, hubs and carriers to provide the toolset appropriate to their specific needs. MixMoveMatch.com was appointed by the European Commission as best innovation in Europe in the category of Information and Communication Technologies for Society. It has enabled 3M to reduce emissions related to line haul logistics in Europe by 50% and related logistics cost by 35%. For further details on the hub features of MixMoveMatch please check the presentation 29 at IPIC 2017 [Pedersen, J.T. et al.].

In May 2017, MixMoveMatch has been implemented and is operational in more than 30 locations in 18 European countries handling more than 2 million items per month. Binnenstadservice Nederland became the first user who applied MixMoveMatch in the city logistics business in 2016. The highest benefits of the holistic supply chain managament solution for all stakeholders, but notably for shippers, can be achieved if suppliers, carriers and hubs are covered throughout the supply chain from supplier to consignee (see central flow in *Figure 2*). If mainly the optimisation the usage of vehicle capacity should be achieved the involvement od the various hubs in a supply chain is sufficient (left flow in *Figure 2*).

Another city logistics implementation could be done at the cargo bicycle carrier Camisola Amarela in Lisbon, who aquired a new customer instandly after implementing the IT-solution MixMoveMatch due to its capability to exchange data using standardised interfaces.

4.3 Benefits observed and experiences made

Completing the triple X and triple P model by involving MixMoveMatch Binnestadservice nederland gained the following benefits and made the following experiences with the approach taken:

- added value for shippers, carriers and consignee are highly relevant
- it is profitable notably for smaller retailer and companies
- start financing is necessary in most cases – operation needs to be profitable on long term
- reduction of frequency of unloading/loading activities and presence of delivery trucks on city roads could be achieved [van Rooijen]
- there is little effect on air quality due to dominance of other emitting vehicles [van Rooijen]
- the software offers higher flexibility while at the same time reducing administrative effort
- the software enables consolidation of increasingly smaller shipments
- the software makes city logistics more attractive due to a much easier embedding in the supply chain from shipper to consignee
- with an increasing number of participating cities, the benefits increase disproportionately
- finally, it is a best practice case for other cities, even the smaller one

5 Benefits for all stakeholders

The combination of neutral acting urban logistics hubs and cloud-based management offer the following benefits to the advantage of all stakeholders in the supply chain:

- free choice of each single logistics service provider in each part of the logistics chain by the shipper

- bundling even of the smallest volume to reduce delivery tours within the city
- flexible integration of delivery tours in the city centre on the physical and IT level
- continuous visibility of the supply chain in all cities served for all stakeholders regarding the data allocated to them,
- guarantied confidentiality of the data by a neutral IT service provider
- demand specific scalability of the performance criteria in cross-docking und on the delivery tour
- short-term responsiveness on changes and deviations due to a fast IT-based planning
- short cycle time from shipper to consignee due to short-term dispatching of ad-hoc orders
- low initial threshold even for small volumes by applying user-dependent pricing
- integration of further service provider due to standardised interfaces
- applicable even for smallest volumes for delivery to retailers and customers (B2C, B2B)
- enable shippers to postpone and trigger the customization of their load (goods to be delivered) close to their receivers (customers).

6 Conclusion

The implementation of a fully collaborative network of city logistics hubs and services is at its very beginning. The long-term vision is to implement a network of smart city hubs all over Europe. A step forward has been done by convincing Rome and Gothenburg to test the approach notably regarding the IT solution in their local environment. City logistics hub will only succeed if they are acting together with one face to the customers.

There are ambitions on the way to create the right governance structure of the group of Smart City Hubs. The approach is to develop a constructive and effective collaboration between the individual local Smart City Hub companies. Regarding the ambition to create a European organisation based on good governance principles a method will be developed for steering this organisation by providing valuable ‘open’ construction principles and procedures that can be used for designing and running this wide range of organisations.

Furthermore, there are several incentives from the sharing economy. An increasing fragmented and volatile demand for logistics service requires an increased flexibility on the supply side. An example is the share of warehouse space or delivery vehicle transport space [Gesing]. IT-solutions are the enabler to be able to manage such complex and fast acting processes in competitive and environmentally sustainable way.

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