



Final Report

Logistics schemes for E-commerce

Technical report

Non-binding guidance documents on urban logistics
Nº 4/6

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Glossary and definitions

3PL:	Third Party Logistics Service Providers
APL:	Automated Parcel Lockers
B2B:	Business to Business
B2C:	Business to Consumer
C2C:	Consumer to Consumer
EC:	European Commission
EU:	European Union
GDP:	Gross Domestic Product
GNSS:	Global Navigation Satellite System
HD:	Home Delivery
LSP:	Logistics Service Providers
NPO:	National Post Operators
ODD:	On Demand Delivery
PP:	Pickup Points
SPB:	Smart Parcel Box
UPS:	United Parcel Service
USO:	Universal Service Obligations
UVAR:	Urban Vehicle Access Regulation

Executive Summary

The European Commission's communication on e-commerce together with other initiatives identified the physical delivery of goods ordered online as one of the key elements for e-commerce growth. Delivery services offered by e-retailers are one of the fundamental factors influencing a consumer's decision to shop with them. Currently, delivery and product returns are amongst the top concerns of both e-shoppers and e-retailers in the EU.

E-retailers are under time pressure. The viability of their business depends on the ability of the delivery sector to deliver at low cost, and in a convenient manner.

If two-thirds of e-customers in Europe prefer home deliveries, alternatives are becoming mainstream: already 47% of e-consumers use Pickup Points (PP). The current delivery system is not handling customer returns correctly, despite customer comments that returns are important for them.

In the last decade, the e-commerce market has experienced strong growth as well as sweeping change. The expansion of the market has coincided with the upsurge in direct-to-consumer home deliveries. The last mile of home delivery is currently regarded as one of the more expensive, least efficient and most polluting sections of the entire logistics chain. A substantial proportion of home deliveries are performed by vans, which is a drawback, as they translate into higher emissions per parcel as compared with delivery by truck.

The increased popularity of online shopping leads to a growing amount of delivery vehicles in residential areas to deliver the packages to consumer homes. As the share of home deliveries increases, so does the number of failed deliveries, which implies that customers need to be at home when the parcel is delivered, which leads to increased delivery cost as the package needs to be redelivered or returned to the sender.

Pickup Points (PP) represent a delivery scheme where customers select to receive the goods they have purchased through e-commerce, at a specified location different than their own home. Goods are delivered to places where customers can collect or even return them. At a PP, the store personnel manages the collection procedure during the opening hours of their host business.

A study in The Netherlands show that the more PP service points online shoppers can reach within 5 minutes by car from their place of residence, the higher the probability that they will use PP collection/delivery.

A delivery policy which allows failed first-time home deliveries to be automatically directed to the consumer's nearest pickup point (PP) could benefit all parties. It would reduce the aggregate mileage associated with either redelivering or collecting missed packages and saving time to both, carrier and consumer.

Automated Parcel Lockers (APL) are used for unattended parcel reception/delivery. Lockers are in apartment buildings, work places, car parks or railway stations. Customers are not usually assigned to their own locker to optimize usage. Parcels are delivered to APL where customers can pay, collect and if necessary return the parcel.

Customers that collect their parcels at APL are not bound to store opening hours, nor do they have to wait until personnel have time for them. In addition, collecting a parcel can be done anonymously, as no human interaction is required.

With the selection of appropriate locations, parcels can provide a solution to deliveries of online purchases, but also or primarily, they can have a positive impact on the reduction of congestion and pollutants from Urban Freight Transport.

One important trade-off for APL implementation is the fact that delivery of the last leg of the supply chain is done by the customer.

Barriers and enablers are laws and regulations, insufficient infrastructure, lack of funding, political and cultural support, practical and technological issues, and the impacts of urban freight transport.

Decision makers need to consider combinations of data-collection methods to identify the best way to tackle the issue in their city. A thorough ex-ante evaluation is necessary to make the outcome of the implementation more valuable as well as to show the actual impacts.

The increasing use of fulfilment centres inside cities would encourage the use of sustainable methods of last-mile delivery such as walking, using bicycles, motorcycles, or electric vehicles. Support is needed from the local authority's planning department to dedicate land for these warehouses.

A model helps to clarify the working process and to identify all the steps needed. Yet it is not the solution to all problems with urban freight transport. Both peer-to-peer meetings for knowledge transfer between cities and easily accessible information are essential.

Chapter 1 Approach

This technical report is the fourth of a series of six prepared within the scope of the Study on Urban Mobility - Preparation of EU guidance on Urban Logistics (MOVE/C1/2014-370) commissioned by the European Commission. Technical reports aim to help stakeholders understand the challenges brought about by logistics activities in an urban context, and identify the most suitable measures and actions to overcome these challenges.

This technical report (N° 4) covers logistics impacts and challenges for e-commerce. It provides specific information on the most important schemes to achieve more efficient and sustainable urban logistics operations.

The primary target group this technical report aims at are public authorities, such as municipalities or local agencies, responsible for the management of the traffic, transport and transport infrastructures within urban regions. Furthermore, logistics and freight transport operators with city operations may benefit from this report.

1.1 Structure

Chapter 1 describes the approach used. Chapter 2 is dedicated to the introduction of logistics schemes for e-commerce. Chapter 3 delineates the e-commerce activities. Chapter 4 describes Home Delivery (Parcel Delivery, Smart Boxes and On Demand Delivery. Chapter 5 talks about Delivery Collection (Pickup Points, Automated Parcel Lockers and E-Groceries). Chapter 6 covers Barriers and Enablers of Logistics Schemes for E-Commerce. Chapter 7 provides Recommendations and finally References are provided.

Chapter 2 Introduction

2.1 E-Commerce

E-commerce is one of the main drivers for a more prosperous and competitive Europe, with significant potential for contributing to economic growth and employment^[1].

The European Commission's Communication on e-commerce together with other EU initiatives^[2] has identified the physical delivery of goods ordered online as being one of the key elements for e-commerce growth. Delivery services offered by e-retailers are one of the fundamental factors influencing a consumer's purchase decision. Currently, delivery and product returns are amongst the top concerns of both e-shoppers and e-retailers in the EU^[3].

A study by Copenhagen Economics (important consultants on European economy) has confirmed that delivery-related problems heavily influence whether e-shoppers finalise their purchase or abandon attempts to buy online^[4]. Their research reveals that the most important aspects of delivery for e-shoppers are:

- Low delivery prices.
- Delivery to home address.
- Access to electronic delivery notifications and track and trace.
- Convenient return options.

Consumers often do not know what delivery options are available to them, when and how a parcel may be delivered to them, and how they can return it should they wish to. They complain about long delivery times and the lack of information about the delivery process. They frequently consider prices for cross-border delivery as being excessive.

E-retailers are under time pressure. The viability of their business depends on the ability of the delivery sector to deliver at low cost and in a convenient manner. This applies to small players on the e-commerce market. Due to lower volumes, they have insufficient bargaining power to successfully obtain substantial discounts from delivery operators and are thus confronted with less favourable delivery options. At the same time, they lack the capacity to invest in their own delivery network. In an environment characterised by economies of scale, they are not able to be competitive vis-à-vis larger e-retailers.

Delivery operators must find appropriate responses to their customers' changing delivery expectations, while considering challenges such as the high cost of the first and last mile, or the decreasing willingness of customers to pay for home delivery. Making customers aware of the true price of transport is increasingly difficult.

2.2 Authorities (Regional/Local)

Freight transport because of e-commerce is, from a local authority point of view, seen as a "business problem" which resolves itself since there is an economic interest in doing so. There is an interest from the transport operator's side, amongst others, to have as efficient transport as possible. However, the possibilities of providing an efficient transport service are sometimes in conflict with, for example, regulations on infrastructure or passenger transport.

Urban authorities, confronted by complaints made by residents and various road users, have, for some time, responded reactively rather than proactively to the negative environmental impacts of urban freight. Accordingly, policy and regulatory measures implemented by urban planners have aimed at limiting rather than extending freight operations.

2.3 Cross-Border E-Commerce

Companies that wish to sell goods and/or services in foreign countries often face several challenges and burdens. Cross-border delivery operations are affected by a high number of additional regulatory and administrative requirements. Besides issues such as internet security and data protection or e-payment, one of the biggest hurdles to the growth of cross-border e-commerce is e-logistics^[5].

The growing demand for the provision of high quality and affordable cross-border B2C parcel services therefore represents both a new challenge for traditional post operators – and at the same time one of the most promising growth markets for them in times of steadily declining letter volumes^[6]. These operators are currently reorienting their processes towards efficient, traceable and affordable (cross-border) parcel delivery services.

Private parcel and express operators also need to adapt to the rapid growth of e-commerce-driven B2C shipments, both nationally and across borders. These operators – who still dominate the cross-border parcel markets – need to adapt their B2B-oriented operations to the needs of individual customers, and to invest in sorting capabilities, retail networks and parcel return systems.

The 2012 Commission's Green Paper "An Integrated Parcel Delivery Market for the Growth of E-Commerce in the EU"^[7] sets out the main issues. It places emphasis on the cross-border delivery of parcels. The Roadmap aims at the following three objectives:

- Increased transparency and information for all actors along the e-commerce value chain.
- Improved availability, quality and affordability of delivery solutions.
- Enhanced complaints handling and redress mechanism for consumers.

Both the responses to the Green Paper consultation^[7] and specific surveys, studies and workshops confirm that delivery is a key factor in the overall development of e-commerce. Yet the expectations and needs of consumers and e-retailers are not always met in terms of speed, quality, reliability or cost of delivery^[3]. The bulk of consumer complaints received by the European Consumer Centres Network regarding online cross-border transactions concern problems with delivery.

Any action should be coherent with related initiatives, notably in the context of the 2011 Transport white paper^[8], and any follow-up initiatives (such as the e-freight initiative), or actions on city logistics, sustainable urban mobility planning (SUMP)^[9], as well as air (noise/quality) regulation.

E-commerce is also a spear action point in the EC's Digital Single Market initiative (adopted in May 2015¹). It is built on three pillars: (i) better access for consumers and businesses to digital goods and services across Europe; (ii) creating the right conditions and a level playing field for digital networks and innovative services to flourish; (iii) maximising the growth potential of the digital economy.

More information on current actions following the Digital Single Market initiative can be retrieved at: https://ec.europa.eu/commission/priorities/digital-single-market_en

The directive's first pillar is tackling geoblocking, aims to make cross-border e-commerce easier and will contribute to more efficient and affordable parcel deliveries. The Commission also

¹ COM(2015) 192 final

launched an antitrust competition inquiry into the e-commerce sector in the European Union, which resulted in SWD(2017) 154 final.

Chapter 3 Delineation of E-Commerce Activities

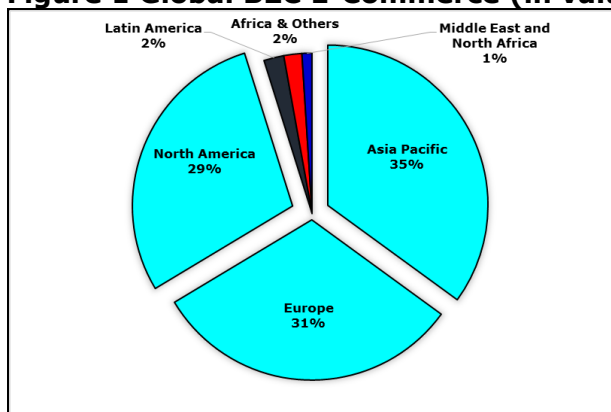
3.1 E-Commerce Definition

According to the OECD, "An e-commerce transaction is the sale or purchase of goods or services, conducted over computer networks by methods specifically designed for receiving or placing orders. The goods or services are ordered by those methods, but the payment and the ultimate delivery of the goods or services do not have to be conducted online. An e-commerce transaction can be between enterprises, households, individuals, governments, and other public or private organisations"^[10].

3.2 The Global and European E-Commerce Market

E-commerce Europe estimated the total Gross Domestic Product (GDP) of Europe to have reached €17.3tn in 2014, while the share of the e-commerce economy in the GDP is 2.45%^[5]. Asia-Pacific was the strongest B2C e-commerce region in the world in 2014. With a B2C e-commerce turnover of €581bn, it ranks ahead of Europe with €424bn and North America with €394bn (Figure 1 below).

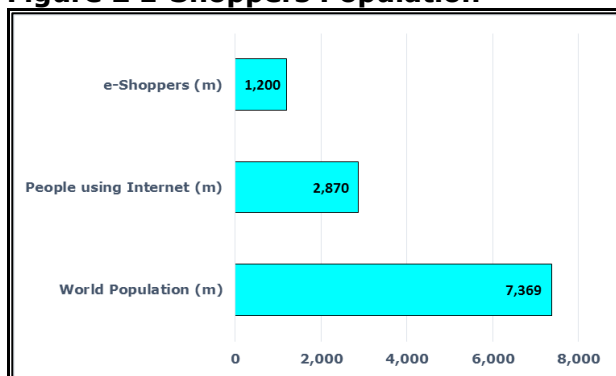
Figure 1 Global B2C E-Commerce (in value)



Source: Own elaboration based on ^[5]

The global population amounted to around 7,360m in 2014, of which 1,200m purchased goods and/or services online at least once (Figure 2 below).

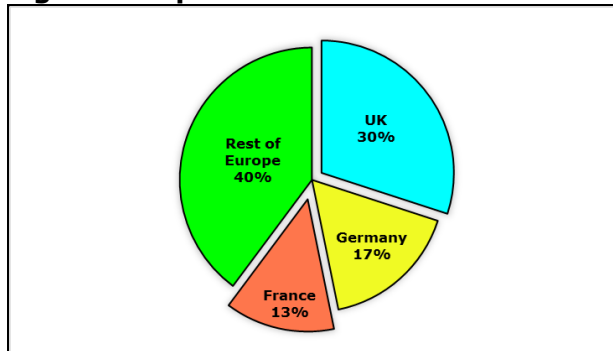
Figure 2 E-Shoppers Population



Source: Own elaboration based on ^[5]

The share of the top 12 countries in the total European B2C e-commerce markets is 88% (€372.7bn vs €424bn). Together, the UK, Germany and France account for 60.2% of e-commerce in Europe^[5] (Figure 3 below).

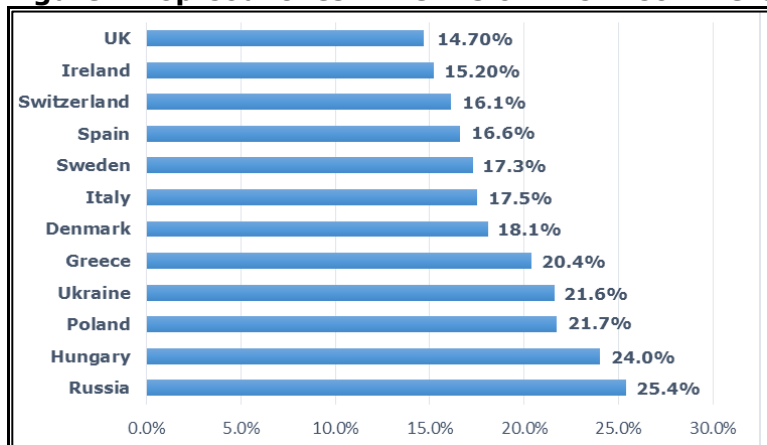
Figure 3 Top Countries in Terms of B2C Market Share



Source: Own elaboration based on ^[5]

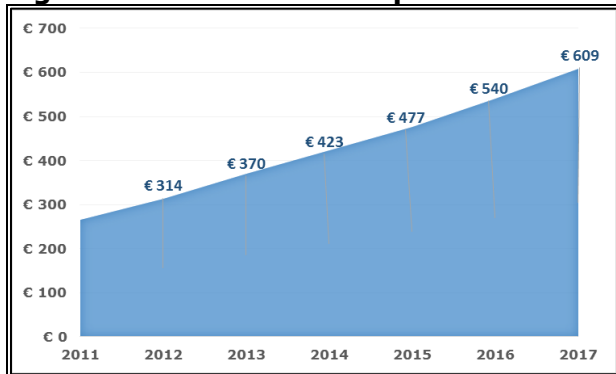
Russia was the fastest riser in 2014, with a 25.4% growth. This is significantly higher than the growth rates of the top three countries (UK, Germany and France) in terms of B2C e-commerce turnover^[5] (Figure 4 below). These are more mature e-commerce markets, where e-commerce's rapid growth began in the mid-2000s.

Figure 4 Top Countries in Terms of B2C E-Commerce Growth Rate



Source: Own elaboration based on ^[5]

An interesting trend is that the growth rate of the mature markets is levelling off. However, the overall European growth rate is maintained due to the rapid increase of Eastern-European e-commerce markets^[5] (Figure 5 below).

Figure 5 Forecast of European B2C E-Commerce Turnover

Source: Own elaboration based on ^[5]

Decisive factors for such a growth will be confidence in surfing the web, higher disposable income, mobile internet through smartphones and tablets and affordable, reliable and fast e-logistics delivery.

3.3 The E-Commerce market by product classification

B2C e-commerce includes all online transactions between business and consumers using desktop computers, laptops, tablets, smartphones, point-of-sales and smart wearables, for instance through online shops, physical stores (online instore), email, QR (Quick Response) codes and catalogue^[11].

Half of e-commerce sales directly translate into freight volume and deliveries. The other half is services, which do not generate deliveries. Therefore, data are misleading because the interest is in physical goods. A clear definition is needed of B2C – and maybe C2C – leading to delivery.

In the US and Europe, the sales of physical goods, not services (although the data has not always ways to differentiate), represent about 55% of overall B2C e-commerce.

3.4 E-Commerce Actors

E-commerce does not necessarily imply the absence of physical stores but rather an evolution of the way in which retailers fulfil orders. For this reason, E-commerce has led to an increase in innovative combinations of physical and digital solutions such as home delivery, pickup points, automated parcel lockers and other collection methods. A difference can be made between pure players and multichannel retailing:

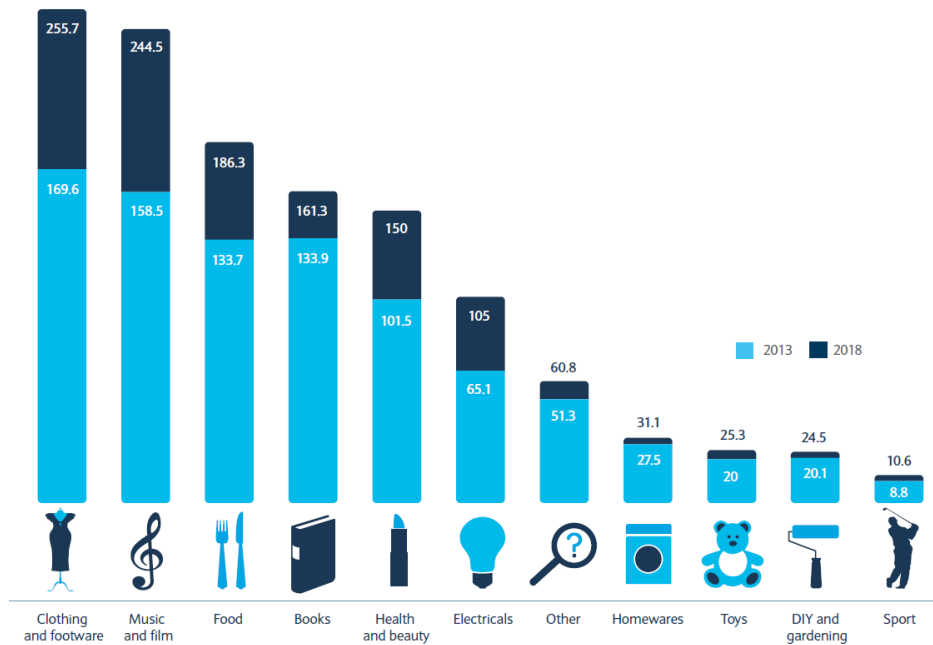
- Pure players are online selling platforms. These include online retailers such as Amazon, Cdiscount, Zalando, or online market places between sellers and buyers such as eBay, Priceminster, Amazon Marketplace, etc. Some of these pure players are generalists (Amazon, Cdiscount) and some are specialised in specific sectors, such as Zalando, which specialises in clothing and shoes.
- Multichannel retailers are mostly physical shops known as click-and-mortar. These are traditional businesses such as Walmart and Auchan, who have launched online services to gain a share of the e-retail market.

3.5 The E-Commerce market by products

Clothing and footwear sales represent the items generating the largest number of deliveries in today's market and are expected to continue to do so in the years to come^[12].

According to a study by Barclays (2014), letterbox-sized packages and small parcels (i.e. no larger than a standard UK shoebox) comprised 59.5% of all deliveries from orders made online, with an average growth of 42% predicted between 2013 and 2018. (Figure 6 below).

Figure 6 E-Commerce Number of Deliveries (m) by Product Type



Source: ^[12]

The higher the internet sales, the more parcels are sent. However, per the US DOT data as tabulated by Brookings (assembling several decades of US DOT data on vehicle miles travelled), over this same period truck traffic in urban areas has declined. Improved logistics performance can explain the difference in the growth rate, through load rate optimisation, multiple customer deliveries on the same trip, or shorter distances with the development of sorting centres closer to the city centre.

3.6 E-Commerce Logistics and Delivery

E-commerce has changed the conventional process of how goods are moved from the seller to the customer. Goods purchased online are delivered by e-commerce transport players, through different logistics schemes (home delivery, pick up points, etc.). This raises concern regarding the freight flows generated by the growth of e-commerce, in urban areas. Trends seem to indicate that B2C e-commerce for goods is increasing the total number of urban freight movements and is leading to a greater fragmentation of consignments at the city logistics level. It is tending to increase the amount and the frequency of deliveries and decreasing the size of a single delivery.

On the other hand, B2C e-commerce for services has eliminated delivery trips by allowing some products to be downloaded electronically (books, music, home entertainment). A statistical estimation of any saving of delivery trips has not yet been made.

3.7 E-Commerce and Urban Freight Traffic

The increasing volume of e-commerce transactions has, in turn, created an upsurge in freight traffic for deliveries to residential areas and office districts previously dominated by personal transport. In 2013, Copenhagen Economics^[4] reported shipments of 6,406 million units in the European Union, 56% of them were B2C (3,614 million units), 29% were B2B (1,868 million units) and 14% were C2C & C2B (923 million units). Domestic shipments have a share of 85% (5,429 million units), Intra-EU cross-border shipments are 12% (777 million units) and Extra-EU cross-border shipments are only 3% (199 million units).

This amplifies the conflicts in urban goods movement:

- Logistics service providers try to minimise logistics costs, which are under pressure due to growing demand from shippers for services such as time-specific deliveries, temperature control and regulations.
- Governments are seeking to reduce negative impacts on environment and quality of life from growing urban freight transport.

Studies suggest that e-commerce does not reduce urban freight and may even increase it as the reduction of personal shopping trips is replaced by an increase in delivery trips.

It has been suggested that the expansion of e-commerce may lead to the atomisation of freight flows, increased carrier competition, increased order flexibility (supporting on-time delivery), often with less than a full truck load, at higher frequencies and with smaller vehicles.

3.8 E-Commerce and Customer Shopping Trips

In Sweden, shopping trips represent approximately 13% of the total energy use for passenger transport, and there are similar metrics in other European countries. However, the impact of e-commerce on personal shopping trips is not homogeneous per the period and country.

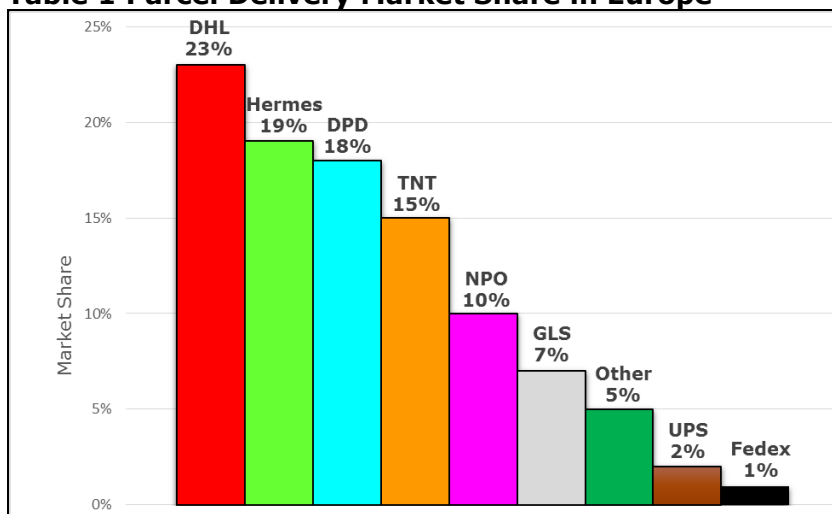
A Swedish survey by Prof. Hiselius on consumer buying and travel habits, based on the travel diaries of regular and not-online shoppers shows that:

- Overall, those who shop regularly online make the same total number of trips as those who do not shop regularly online.
- There is no large difference in individual trips, there is no difference in the mode of travel between regular online shoppers and non-regular online shoppers.

Thus, although a shopping trip may be substituted for by online purchase, the overall travel behaviour regarding the total number of trips and trip length remains largely unchanged for online shoppers.

3.9 Parcel Delivery Market Share in Europe

DHL delivered 23 percent of all parcels in Europe from business to customers (B2C) in 2011, making it the market leader (number of packages delivered)^[13]. Table 1 below shows the parcel delivery market in Europe, including domestic and cross border.

Table 1 Parcel Delivery Market Share in Europe

Source: Own elaboration based on ^[13]

3.10 Typology of Parcel Delivery Market

The typology of e-commerce parcel delivery markets consists of four different types of players: National Post Operators (NPO), Global Integrators, Parcel Carriers and Last Mile Specialists^[4, 14] (Table 2 below)

Table 2 Typology of Parcel Delivery Market (examples of companies)

NPO	Integrators	Parcel Carriers	Last Mile Specialists
PostNL	DHL	Hermes	Doodle
Deutsche Post	Fedex-TNT	DPD	Bring
Royal Mail	UPS	GLS	Kiala
Bpost		DHL Parcel	BubblePost
USPS			Packstation
Post Denmark			Parcel Shop
			the Green Link

Source: Own elaboration based on ^[4, 14]

National Post Operators

NPO offices are present in every country to provide the Universal Services Obligation (USO), which refers to the baseline service to every resident of a country. In recent years, the postal service has been deregulated: the NPO must satisfy the standards of the national USO but is experiencing more competition. In the parcel sector, competition is keen. Generally, NPO operations serve different countries (e.g. PostNL in Belgium, La Poste in France or Royal Mail in the UK^[4]).

Home delivery is commonly provided by all NPOs. Similarly, delivery to work addresses and returns to a post office has almost 100% coverage throughout Europe. Features such as track and trace are provided by almost all NPOs. With respect to the provision of return options, almost all NPOs provide track and trace for return parcels. Moreover, almost all NPOs allow e-shoppers to return a parcel by handing it in at a post office or a collection point, whereas only a smaller number allow the e-shopper to arrange for the parcel^[4] to be collected for return.

NPOs still retain an important market share of home parcel deliveries in European countries. For B2C shipments, the EU-wide NPO market share is 35%. It is 54% on average in countries with good e-commerce performance (UK, Germany, France, Sweden, Finland, Denmark and The Netherlands) and 31% on average in other European countries^[4].

Global Integrators

These companies have a worldwide presence. They are vertically integrated, providing door-to-door services, and own their fleet of aircraft and trucks^[15]. To offer an integral service, they own extensive worldwide networks, enhanced with subcontractors. The main operators in this category are DHL, UPS and FedEx. These companies act as integrators for international shipments, leaving the standard deliveries to parcel carriers companies, or to parcel divisions within the same integrator company (e.g. DHL-Parcel for DHL)^[4]. On the European market, DHL (Deutsche Post DHL) is the market leader.

Parcel Carriers

While many studies include this group either within the category of Integrators or Specialists, they are important to clearly distinguish, because parcel carriers, together with the NPO family, represent the core of the e-commerce delivery market in terms of volume. These companies usually cover a regional area and in many cases, are subsidiaries of an NPO, an integrator or a logistics provider.^[14, 16] These companies are specialized in parcel deliveries. Their background is in the B2B market, and they are slowly adapting to the B2C market, facing the constraints of their capacities, and the strong competition from NPOs and a wide array of last-mile specialists.

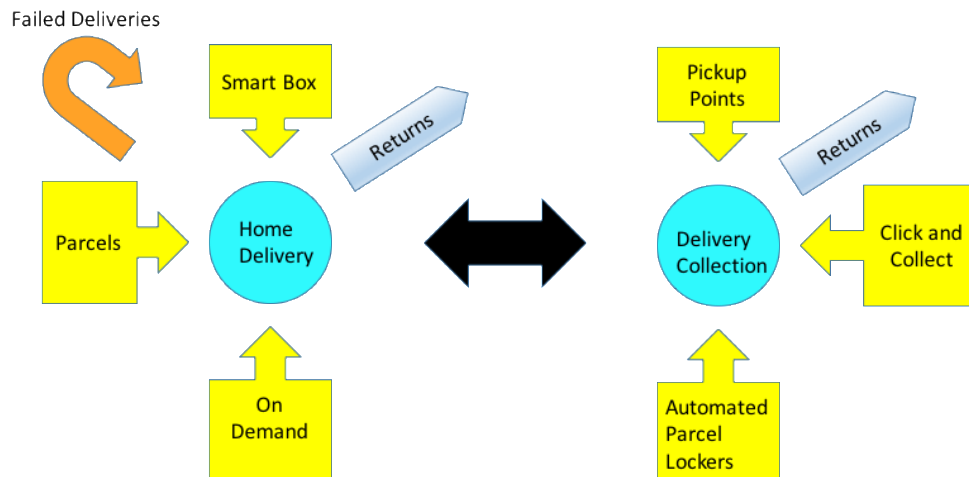
The Last Mile Specialists

This group is composed of small and innovative companies providing solutions for urban settings. They cover a local area and are often subcontractors for NPOs or Integrators. Sometimes, they are the subsidiary of an NPO or Integrator. They are focused on providing sustainable delivery using non-traditional vehicles (bikes, cargo bikes, etc.) to avoid the negative externalities of transport^[14, 16]

Chapter 4 Home Delivery

Logistics schemes are divided in two groups: Home Delivery and Delivery Collection. Home Delivery is composed of Parcel Delivery, Smart Boxes, and On Demand Delivery (See Figure 7).

Figure 7 Available Options of Logistics Schemes for E-Commerce



4.1 Parcel Home Delivery

In the decade starting in 2000, the e-commerce market for products ranging from high-value durable goods to low-value consumer goods experienced strong growth as well as sweeping change. The expansion of the market coincided with a surge in direct-to-consumer deliveries. While this type of service is not new (as evidenced by the mail-order firms of the 1980s and 1990s), the e-commerce boom has certainly stimulated its further development. Concurrently, this development has drawn attention to certain issues in the final part of the supply chain. These are referred to collectively as home delivery (HD)^[17] (Figure 8 below)^[18].

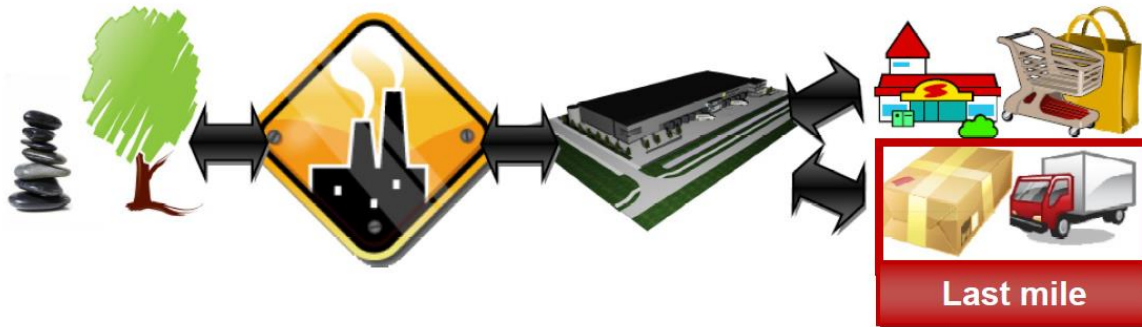
Figure 8 Home Delivery



Source: ^[18]

The last mile of HD is currently regarded as one of the more expensive, least efficient and most polluting sections of the entire logistics chain. This is due to several inherent factors. In HD, for example, the security aspect and the associated not-at-home problem must be considered, especially as it is likely that the addressee may have to sign a confirmation of receipt. This results in high delivery failure and empty trip rates, which inevitably impact substantially on cost, efficiency and environmental performance (cf. emissions). A substantial proportion of HD are performed by vans which is considered a drawback, because vans have higher emissions per parcel than trucks ^[17]. Figure 9 below is a schematic representation of the last mile in HD.

Figure 9 Basic Structure of a Home Delivery



Source: ^[19]

Due to its specific delivery structure, the last mile is considered an expensive section, if not the most expensive, in the entire supply chain. Last-mile costs may amount to between 13% and 75% of the total logistics cost^[15, 20]. These high proportions are due to inefficiencies and poor environmental performance. Therefore, as the core business for shippers and couriers, HD has been thoroughly investigated during the past decade ^[21-23], as has grocery shopping ^[24-27].

The development of e-commerce and the increasing number of deliveries, reinforce the concept of the use of third party logistics service providers (3PL) for the final delivery. The high cost of urban delivery, the flexibility and seasonality of flows, and the delivery and regulatory constraints in cities, explain why some actors subcontract to others. It appears that the denser and more constraining a city is, the more subcontracting there is^[28]. 3PL represent 50% of UPS' activity in Paris, 95% to 100% of Geodis', and 80% of that by Chronopost^[16].

Parcel transport (less than a full truck load) and express services are one of the fastest growing urban transport businesses. This industry uses large vans or small to medium-sized trucks, and is based on consolidated delivery tours departing from cross-dock terminals in suburban and inner urban areas. Vehicles from the leading express transport companies are now in most of the world's cities with some geographical specialisation (DHL in European cities, UPS in US cities)^[29].

Examples of Parcel Home Delivery: GeoPost, Hermes and Royal Mail

UK Parcel Market^[30]

The home delivery market in the UK is undergoing rapid transformation. The reports that followed (including a BBC TV documentary) raised awareness of the whole sector, shifting the spotlight onto the business models of the remaining players, as they seek to satisfy an increasingly demanding mix of customers whilst keeping a tight lid on costs.

To better understand these market forces, a strategy analysis was done of the two fast growing companies in the market – GeoPost and Hermes – and the market leader – Royal Mail Group (RMG) with its twin brands Royal Mail and Parcelforce Worldwide.

Customers / Market Definitions

Anyone operating in this market interfaces with two sets of 'customers' – the retailer who ships the parcel and the consumer – its end recipient. Both are equally important, because whilst price sensitivity is a key part of the equation, differentiation is increasingly about the whole 'delivery experience'.

This particularly rings true in the B2C market segment (£2.9bn), now accounting for 34% of the total domestic parcels market value, versus the B2B market (£4.5bn) at 54% of the market. In 2010, B2B parcels dominated with 74% of the UK market value versus only 15% for B2C, so the gap has narrowed significantly. However, the operators need to move many more parcels in the B2C sector to generate like for like revenues with the B2B sector, illustrating the need to invest in infrastructure and control costs.

Of the three companies profiled, both GeoPost and Royal Mail have important B2B and B2C traffic streams, whereas Hermes, now owned by Otto in Germany, is almost entirely focussed on the B2C market.

Branding

As the parcel companies improve the end delivery experience, their visible branding assumes greater significance. DPD / Interlink and Parcelforce Worldwide both prefer the 'man with a van model'. The GeoPost model is based on a mixture of owner drivers who have a routed franchise and employed drivers. In contrast, Hermes prefers the 'lifestyle courier' model where goods are delivered in unbranded private cars. Apart from being cost-effective – a courier can typically deliver 60 parcels per day, Hermes feels this model is well suited to their B2C customer base.

Multichannel Option

Competition comes from many directions. Leading retailers have already seized the initiative by offering their own popular 'Click & Collect' services, which effectively bypass the parcels delivery company and eliminate the delivery charge for the end customer. Powerful online retailers like Amazon have set up their own local delivery networks, effectively competing with their own suppliers. Whether motivated by security of supply or the relentless focus on customer experience, this still represents a threat to the parcels operators.

Timed Delivery

Timed delivery slots are becoming the industry benchmark to which the most progressive operators aspire. GeoPost has pioneered this product with its 'Predict' service, which offers one-hour delivery slots notified by text or email. Hermes, recognising this is an essential part of the armoury of a modern parcels operator, is rolling out its 'Hermes ETA' service in August 2015 – initially with a four-hour delivery window and then (over time) reducing to a two-hour then a one-hour slot.

But the Holy Grail in this market is to offer the recipient 'in flight options' whereby end consumers can elect (in the final 24-hour window) to divert the parcel to another day or time slot, to a neighbour or even a parcel shop.

Retailer Cost Pressures

It is not just the final customer who is becoming more demanding as retailers, seeking a competitive edge over each other, push parcel companies for later acceptance times (Next has recently moved to 11.00 pm) and import 'shopping frenzy' concepts from the USA such as 'Black Friday' and 'Cyber Monday', which create artificial peaks in consumer demand, like Christmas, but focussed on a single day.

This is clearly one area where Royal Mail's sheer scale and long experience in dealing with Christmas peaks gives the newly privatised operator an edge over rivals. Royal Mail delivered a billion parcels in 2014 – roughly five times greater than its nearest rival. Royal Mail can leverage both its delivery networks – both the 76,000 postmen who deliver the smaller parcels and the larger parcels through its Parcelforce network, with its own fleet of vehicles.

Scale / Investment in Infrastructure

GeoPost is investing £100m in its latest automated sorting hub in Hinckley, the largest of its kind in Europe, to open in September 2016, which will dramatically increase capacity for Christmas and beyond.

Hermes has mid 2016 just installed a new state of the art tailor-made (third) hub in Warrington with a £15m investment, plus a further £10m in a new sortation machine, doubling their capacity. In total, Hermes plans to invest upwards of £80m in the next 3–4 years

For RMG, their infrastructure investment is focussed as much on technology as capacity and utilisation. In addition to the recently added second Hub for Parcelforce Worldwide, £130m will be invested over five years in handheld technology, deploying Zebra Technologies TC75 devices to provide more flexible delivery for customers and better tracking capability

The Future

These are exciting and challenging times for parcel operators as they compete to sharpen their offering in an internet-fuelled growth market. Those who can strike the right balance between technology and infrastructure investment to deliver the ultimate 'customer experience', whilst keeping a tight control of margins, are likely to be the ultimate winners.

4.2 Smart Parcel Box

A Smart Parcel Box (SPB) is a box installed at a customer's house, apartment or building. It is a secure parcel delivery and collection system that acts as both a drop box for deliveries and pickup box for shipping. It keeps the packages secure until the recipient can reach them. Some can be shared among many users, providing privacy and safety for each user, and initial investment cost can be shared equally.

The box is built to be weather resistant and strong enough to deal with vandalism attacks. It usually includes an advanced locking system with keypad, as well as a manual override lock. It is large enough to receive around 85% to 98% of products bought online. It is fully integrated with a smartphone app so customers can keep track of deliveries and pickups in real time. Once a package is delivered, customers receive a notification via the company's app on their smartphone.

Example of Smart Parcel Box: ParcelHomes Mechelen

Another unattended solution is the use of Smart Parcel Boxes^[31]. ParcelHomes is carrying out a pilot study in the city of Mechelen (Belgium) installing Recipient Boxes (RB) at recipients' individual homes. RBs are large enough to fit around 95% to 98% of the products bought online and work for both delivery and collection. The RB opening mechanism uses an authentication smartphone app providing security to the owner and access history to consumers. RB is built to be weather-resistant and strong enough to deal with vandalism. The company works in parallel with the main carriers of the area, by providing secure means for couriers of opening the box and delivering the parcel. Once delivered, the parcel is weighted, and the customer receives a notification via the company's app.

From the results drawn, it can be concluded that the RB alternative does provide potential benefits. For e-retailers, RBs can achieve a higher service level, shorter lead times by avoiding

failed deliveries. It is also possible to organize a simpler goods return. Results also suggest an increase in demand because of an improved service level.

For carriers, the main implications come in terms of efficiency. Another effect is that the carriers do not need to invest in a pickup network. However, the consolidation factor is lost, and the rate of number of parcel per stop will tend dramatically to 1. Only the final metres (within an apartment building for example) are consolidated.

For municipalities, the number of kilometres travelled by vans is reduced due to the reduction of failed deliveries, mitigating the negative effects of transport by van in terms of pollution and congestion.

For customers of a pilot study, satisfaction is shown through an increase in 25% of e-commerce demand. Also, e-commerce is enhanced through a smoother delivery system, homogenizing the delivery process.

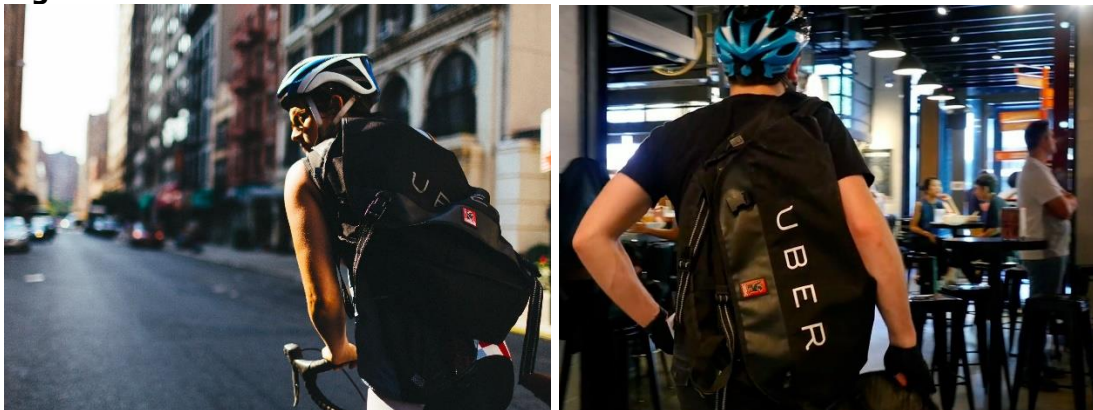
A negative effect is cost. The customer is the one who pays for the service, therefore customers assume the cost of a better service level. Another effect is that security concerns over theft or vandalism are transferred to the customer.

4.3 On Demand Delivery

On-Demand Delivery (ODD) is a delivery concept which has been implemented since late 2014 by new start-up companies.^[32-36] E-shoppers can order products using Apps in their smartphones, and receive their order at home in less than two hours. Couriers using their bicycle or their own car arrive with the order^[36].

On Demand Delivery (ODD), with the potential of creating a new market, not only disrupts the existing market, but displaces existing technology^[37]. ODD includes large companies – Amazon Prime Now and UberRush, as well as start-ups, such as Foodora and Deliveroo. (Figure 10).

Figure 10 Uber's ODD Couriers



Source: ^[38]

ODD companies supported by their technological platform use an extended network of independent delivery couriers^[39], monitor real-time delivery status and verify delivery to the end customers^[35]. By using these services, local retailers can establish home deliveries to serve their urban customers without developing their own technological platforms and logistics solutions^[40].

ODD is a concept being implemented to comply with e-shoppers' delivery expectations^[41]:

- Home delivery

- Fast delivery
- Low price (although the actual cost may be high)
- Product location real time monitoring
- Ease of use.

E-commerce and parcel delivery giant players are addressing ODD. For instance, Amazon is establishing their ODD service known as Amazon Prime Now^[42], while UPS has invested in Deliv^[43].

There are two types of operations that ODD companies use:

- With companies such as UberRUSH, the customer orders from a retail business and the ODD company handles the delivery in the background^[33]. Most customers will not know which delivery company is handling the delivery until after they have checked out and received the text message with a trackable link that says the delivery is on the way^[33];
- With other ODD companies, such as Postmates or TokTokTok, an ODD app displays retail partners and lets users pick from a menu of items in addition to allowing retailers use the ODD company for their deliveries^[33].

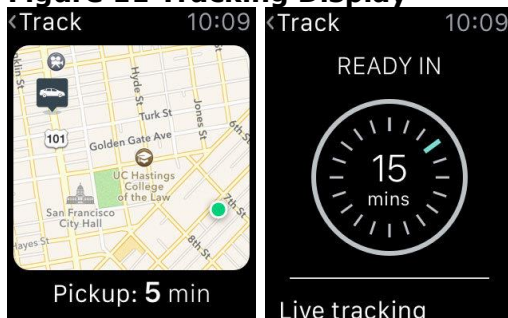
ODD Examples: Postmates and Uber

Postmates

Founded in 2011, it is a logistics company that operates a network of couriers who deliver goods locally. Postmates uses mobile phones to receive orders and dispatch delivery drives^[40]. It wants to enable people to get any product delivered in under one hour^[34]. It charges \$5 to \$20 as well as a 9% service fee to customers on the cost of products^[44].

Postmates uses its network of local couriers, who pick up and deliver goods from any restaurant or store^[34]. Postmates' over 10,000 couriers in dozens of cities in the United States linked, via an app, waiting for e-shoppers to click on their smartphones and send them forth to pick up the order^[45] (Figure 11 below).

Figure 11 Tracking Display



Source: ^[43]

The app allows the customer to track the rider's precise whereabouts and how long the delivery will take^[45]. In December 2014, Postmates opened an application programming interface to allow small businesses to compete for speedy delivery of consumer goods with larger companies^[40].

Postmates started out with a focus on eateries because their menus rarely change and are easily digitalized. A real-time app that allows users to see the product range of retailers is far more complex^[44]. Postmates is gradually introducing new categories, such as supermarkets, electronics stores and drugstores^[34, 45].

Uber

Most local businesses do not deliver their products. Day-to-day operations are already complicated and delivery can cause all sorts of logistical headaches. With the launch of UberRUSH, every business in the areas covered, has the power to get customers what they want, when they want it^[38].

Launched in 2014, the UberRUSH trial lets users hire a courier from the company's app and track the approaching messenger. The key difference between UberRUSH and its competitors like Postmates is that UberRUSH is designed to be the delivery driver, not an app where customers place their order^[33]. Uber is making a big push into on-demand delivery, taking on local courier services as it seeks to expand beyond its original mandate of passenger transportation^[46]. The move represents a bid by Uber to become a full-scale logistics network that will use its fleet of Uber drivers as well as dedicated couriers to move items from one point to another^[46].

UberRUSH is initially aimed at small businesses that do not have the infrastructure for delivery. It has partnered with small business platforms such as Shopify, an e-commerce marketplace, and Clover, a point of sales system, to link in UberRUSH delivery services. UberRUSH charges a fee of \$6.0 per delivery to the businesses that participate^[46].

4.4 Key Factors for Home Delivery.

The following factors are very important for home delivery (HD, SB and ODD):

4.4.1 High Degree of Failed Deliveries

The increased popularity of online shopping leads to a growing amount of delivery vehicles in residential areas to deliver the packages to consumer homes. As home delivery increases, so does the number of failed deliveries, which implies that customers need to be at home when the parcel is delivered, which leads to an increased delivery cost as the packages need to be redelivered or returned to the sender^[16].

Each failure to deliver represents a substantial cost increase for the last-mile provider^[14, 17, 47]. When the consumer is not at home, the courier returns to the terminal and often the next day or at a chosen customer delivery moment, the courier will deliver again. This can be repeated at (maximum) four times and then the goods are returned to the shipper, or the consumer can pick up its goods at the terminal. This results in additional parcel handling and causes additional costs^[48].

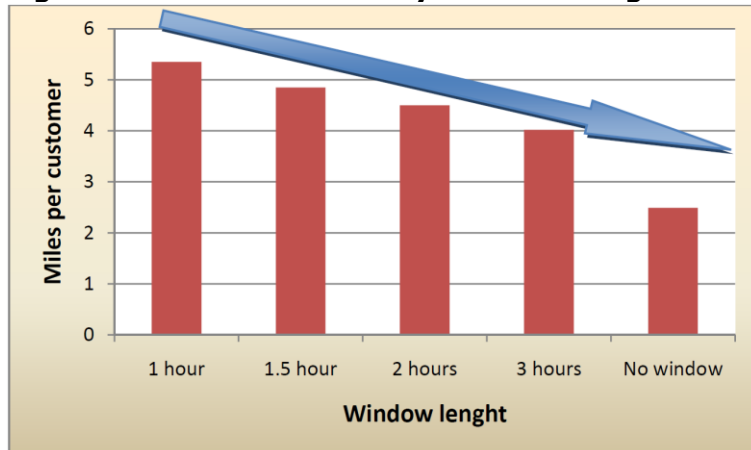
First time delivery is just at 75%^[48]. It is estimated that the average proportion of failed deliveries is between 25% and 30%, depending on the type of product involved^[49, 50].

4.4.2 Delivery Time Windows

Delivery-time windows are specifications on the time and hour of parcel delivery to the final recipient or destination. They include the possibility of delivery on the next day, or delivery within a time range, or at a precise time (i.e. time-definite). Parcel deliveries benefiting from these specified services tend to be more expensive as they set constraints on the optimization of the network. For instance, if most parcels are deferred, and only one is time-definite, the latter becomes a constraint for the vehicle routing of the operator, and all the deferred parcel deliveries need to be re-optimised.

The higher the numbers of time-definite parcels, the more constraints need to be added to the optimization model and the harder it becomes to find optimal solutions. To illustrate this by an example, two parcels set to be delivered at 12:00 cannot be distributed by the same last-mile driver. Thus, there are two options: default to the time-definite commitment, which corresponds to a reduction in service level, or the allocation of the second parcel to an additional driver, which implies duplicating resources and costs^[14, 47, 51].

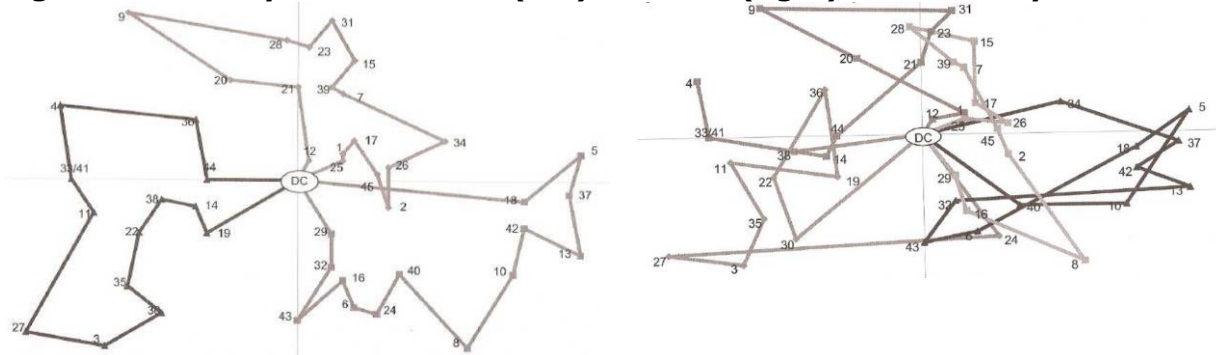
Figure 12 Effects of Delivery Window Length



Source: ^[52]

Figure 12 above indicates that the longer the delivery-time window is, the smaller the number of miles per customer are travelled. Thus, costs will rise as more and tighter time delivery windows are incorporated into the routing schedule^[52]. A study in the greater Helsinki area in Finland found a cost difference of 42% between home deliveries with reception boxes (without delivery-time windows) and home deliveries with delivery-time windows^[53]. Limited delivery windows imply that a courier needs to cover more miles for the same number of deliveries^[54] and consider curfews imposed by local authorities (Figure 13 below)^[54].

Figure 13 Delivery Route without (left) and with (right) time delivery windows



Source: ^[54]

4.4.3 Returns

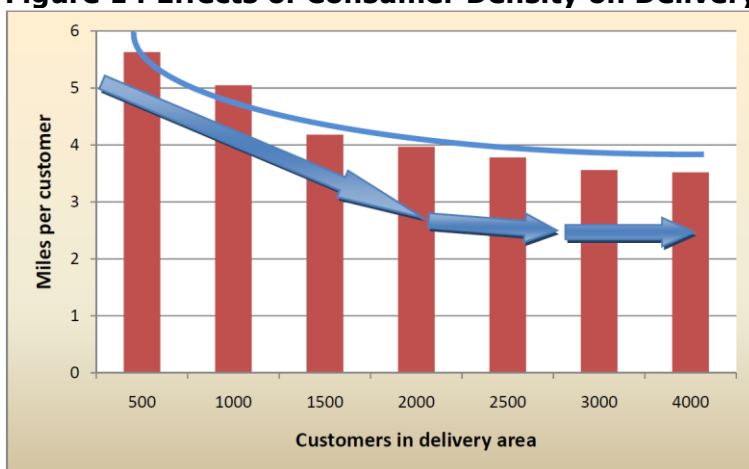
Per distance selling contracts, the consumer can withdraw from the contract, return the product and be reimbursed. Returns are an intrinsic part of the e-commerce experience, allowing the consumer to return defective or unsatisfactorily purchased goods. Whilst many e-retailers offer a free return policy with some restrictions, the cost of picking up an item from the customer must be considered. Returns are not free for any operator. As a failed delivery, a return means an extra trip, and additional sorting to deliver the item upstream in the supply chain^[14, 47].

ODD companies are launching a service giving their clients' customers the ability to log into their account and choose, 'I want to return something,' for example, a dress they bought online which does not fit. They will see a calendar in the ODD app and be able to choose a day and a time when they want someone to come to their home or office to pick up the return^[35].

4.4.4 Density

Higher population density means better logistics performance because it will increase delivery density measured by stop per mile. There is an unequivocal declining relationship between mileage per delivery address and the number of consumers in the delivery area per square kilometre. The optimum is between 1150 and 1950 persons per square kilometre^[52]. See Figure 14 below.

Figure 14 Effects of Consumer Density on Delivery Productivity



Source: ^[52]

A frequently encountered problem is lack of a critical mass in each region, due to an inadequate market density or penetration (urbanisation vs low demand areas). If, by consequence, a courier needs to travel over 30 miles to deliver a single parcel, efficiency will be strongly reduced and costs greatly increased^[14, 17, 51].

Whatever the delivery cost, the delivery price, mostly determined by the market^[14, 55], usually does not vary according to population density. Delivery operations in residential areas follow different patterns, mostly because single-home areas seem to accommodate home delivery more easily^[56].

4.4.5 Carbon Footprint

Consumers recognize that lowering carbon footprint in freight delivery leads to a better environment yet most of them are not prepared to either pay more or wait longer for their goods in return for a greener service^[17, 51].

Carbon footprint can be reduced using environment-friendly vehicles (cargo bicycles, scooters, and electric vehicles) and many ODD start-up companies use them, reducing their carbon footprint.

4.4.6 Delivery Consolidation

Delivery consolidation is the opportunity to deliver a large batch of shipments to the same address. B2C e-commerce, serving individual households, has generally reduced the consolidation factor, implying more stops per tour. In the case of ODD companies, there are no delivery tours, as delivery is generally done on a case-by-case basis, with courier delivery.

The next step for ODD is being able to combine multiple deliveries into one trip, vastly reducing the cost, by applying the concept of pooling to deliveries. Pooling can include services that let one company share the trip and cost with someone else nearby taking the same route^[57].

4.4.7 On Demand Delivery Couriers

Couriers are not employees of ODD companies, but independent contractors. A person can register and decide when they want to work^[45]. In current ODD companies, most couriers supply their own mode of transport, which may be anything from roller-skates to a motorbike or car.^[58] Amazon couriers who deliver parcels for Amazon Flex or Amazon Prime Now are usually not Amazon employees^[42]. They use the app to sign up for shifts to pick up packages from small warehouses near or within metropolitan areas. Legal issues may arise because in some European countries, a transport licence is required when using any motorized type of vehicle (including motorbikes and scooters). For this reason, self-employed couriers not willing to register as freight road hauliers may only use bicycles or other non-motorized modes.

The business model of ODD companies is not yet clear. Whilst ODD is creating new types of urban jobs, it has led to many unresolved legal issues and poor working conditions in many instances. Across a variety of ODD companies, business models are difficult to stabilize and in some cases companies are closing. The lesson so far in the on-demand world is that profitability is the exception, not the norm^[59].

4.4.8 Logistics Facilities

With the rise of e-commerce comes the increase of and need for fulfilment centres. Not all e-commerce leads to dedicated logistics facilities: many e-commerce deliveries are integrated into parcel service deliveries, using parcel logistics facilities. However, a substantial number of new facilities have been emerging dedicated to e-retailers.

E-fulfilment centres are mainly based around the major population centres where online sales densities are highest.

As online retail grows further, speedy delivery of goods to consumers increasingly becomes a competitive advantage. Amazon has started to open smaller-scale distribution facilities within dense urban areas to offer same-day delivery services. In the UK, Amazon is beginning with 20 smaller distribution facilities around major urban areas. With sorting centres in place, it can both provide faster delivery to customers and save on shipping costs. Sorting centres are smaller operations that can be located besides, adjacent to, or near larger fulfilment centres. For its Prime Now service (delivery within less than two hours), by August 2016, Amazon had opened more than 35 urban warehouses in main cities in Europe, the US, and Japan.

4.4.9 Track & Trace

Track & trace are services based on automatic identification of the parcels' location and status by use of technologies such as Radio Frequency Identification (RFID), barcodes, etc. When parts of transport of the delivery chain are outsourced, the subcontracting transportation company usually has the capability to interoperate. Setting up the system requires large set-up costs. However, after amortization of the investment, savings come from eliminating operational costs

of manual routing, costs of re-routing, communication with the transportation manager to check the location of the driver, diversions and all other paperwork involved^[47].

ODD companies use multi-channel platforms (solutions to support the use of smartphones, tablets, PCs and kiosks) and GNSS-enabled smartphones^[43].

4.4.10 Freight Traffic in Residential Areas

Nowadays, policy makers acknowledge the potential growth of freight transport in residential areas caused by e-commerce home delivery^[60]. Couriers are using a variety of transport modes, including foot, bicycles, electrically-assisted cargo cycles, motorbikes, cars and various types of vans and lorries.

This can negatively impact on residential areas, traffic management, road safety and conflicts of road users and congestion. The more quickly delivery is demanded, the less efficient the delivery trip will be and the more freight traffic will be generated in residential areas^[61].

Some companies are testing drones to deliver goods, such as DHL in Germany. Amazon is currently (2016) conducting trials in the UK. The trials look at solving three major problems:

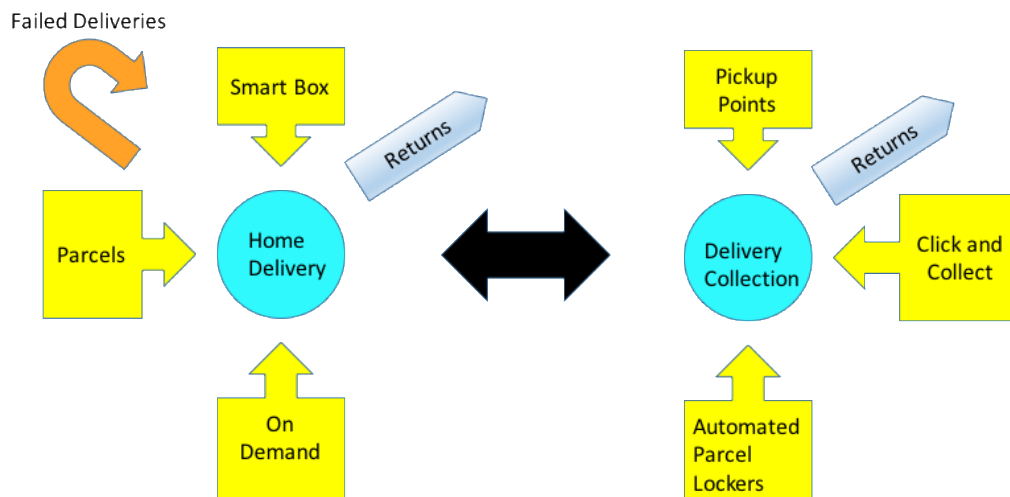
- How can companies operate drones safely beyond “line of sight”?
- How can drones that can avoid objects be built?
- How can a system be implemented where one pilot is responsible for many drones?

Furthermore, there are still questions about privacy and safety^[62].

Chapter 5 Delivery Collection

Logistics schemes are divided in two groups: Home Delivery and Delivery Collection. Delivery Collection is composed of Pickup Points, Automated Parcel Lockers and E-Groceries (Click and Collect) (See Figure 15).

Figure 15 Available Options of Logistics Schemes for E-Commerce



5.1 Pickup Points

Pickup Points (PP) represent a delivery scheme where customers select to receive the goods they have purchased via e-commerce at a specified location which is different from their own home. Goods are delivered to places where customers can collect and even return them. Those places can be local stores, the customer's workplace, parcel shops, post offices, urban or micro consolidation centres, etc. (e.g. Kiala/UPS PP in Europe). At a PP, the store personnel manages the collection procedure during opening hours (see Figure 16 below) ^[56].

Figure 16 Kiala UPS Access Points (PP) in Europe



Source: ^[63]

Customers are generally free to choose the PP from which they would like to collect their parcel. This offers opportunities for trip chaining, as customers can, for instance, visit a PP on their way home from work or on their way from home to a shopping centre^[64].

The strength of PPs is the flexibility of opening times, giving consumers the option to claim their packages at the time that suits them, as well as the lower cost for transport providers compared with home delivery^[56].

Consumers can also use PPs to easily return their online order to the sender. Return rates of online orders vary from product to product, but may run as high as 35% for clothing and accessories^[64].

Table 3 below gives a glimpse of the evolution of selected European PP networks in three countries, with growth rates ranging from 5% to 150% between 2008 and 2012^[65].

Table 3 Trends for PP Networks in Europe

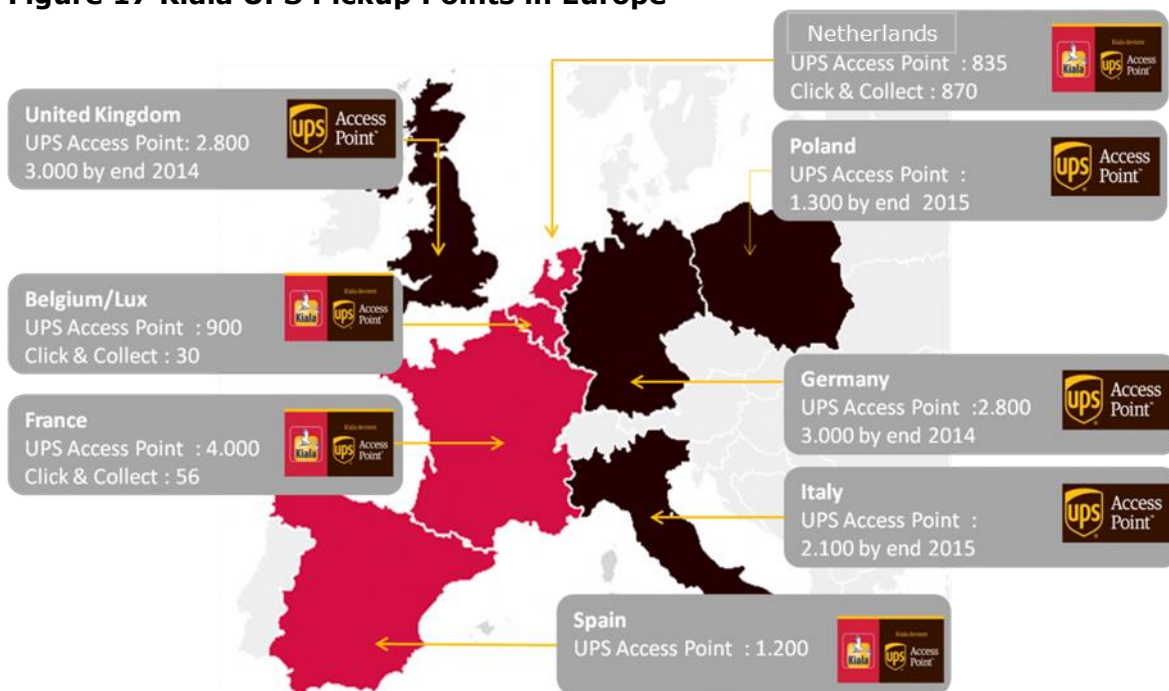
Company	Country	No. Sites 2008	No. Sites 2012	Growth Rate 2008- 2012	Parcel Volume (m) 2012
Collect Plus	UK	1000	1300	30%	n/a
Paketshop (Hermes)	Germany	1000	2500	150%	n/a
Kiala	France	3800 (including Mondial)	4500	18%	15
Pickup Services	France	3100	5200	68%	9
Mondial Relay	France	3800 (including Kiala)	4300	13%	12
Relais Colis	France	4000	4200	5%	23

Source: Own elaboration based on ^[66]

PP Example: Kiala UPS in Europe

A good example of a PP network in Europe is Kiala, born in Belgium in the 1990s, and grown all over Europe. It is now part of UPS. Kiala claims an average cost reduction of up to 10% against current delivery cost per parcel.

Kiala was acquired in 2012 by UPS. The Kiala model had been already established in Belgium, The Netherlands, France and Spain. It was introduced in the UK as UPS Access Point™, and in Germany as UPS Paket Shop™. Today, the network includes over 12,000 PPs in Europe (See Figure 18)^[63].

Figure 17 Kiala UPS Pickup Points in Europe

Kiala offers fast delivery of parcels to a convenient PP. The delivery process to these PP stores is supported by a technology platform. Customers can track their parcel on the internet and are notified by SMS, e-mail or phone when the parcel has arrived at the PP. Kiala consumers, in 2010 - there isn't a more recent source, had the profile shown in Table 4 below.

Table 4 Profile of Kiala Consumers

Profile of Kiala Users	
60%	Women
72%	Between 25 and 54 years old
67%	Belong to the working population
49%	Are part of the top occupational categories

Source: Kiala survey with 10,000 Kiala Consumers ^[63]

5.2 Automated Parcel Lockers

Automated Parcel Lockers (APLs) are groups of reception lockers, which are situated in apartment blocks, work places, car parks, railway stations, or even on the street. To optimize usage, customers are not assigned to their own locker. Lockers have electronic locks with a variable opening code which can be used for different customers. They may be dedicated to one delivery company (this is the most common situation) or used by several. Customers are notified by a message about when their delivery has arrived, the box number and location, and the code to open the box. Like PPs, APLs require the customer to make the final leg of the journey. However, the physical location of the APLs is designed to make the deviation in customers' journeys as short as possible^[55, 64, 67] (Figure 18 below).

Figure 18 APL in ItalySource: ^[68]

Customers have three to nine days to collect parcels from the chosen APL. To ensure safety, most of the time, APLs are in places that can be monitored (e.g. supermarkets, petrol stations). In addition, some APLs are equipped with video cameras and alarm systems.

APLs score well on opening hours, collection and anonymity. Customers who collect their parcel from an APL are not bound by store opening hours, nor do they have to wait until personnel has time for them. In addition, collecting a parcel from an APL can be done anonymously, as no human interaction is required. However, collecting a parcel from an APL requires knowledge on how to operate it, which may be an impediment for certain customers (e.g. the handicapped or elderly)^[64].

APLs can, given the fact that they are appropriately located, provide a solution to deliveries of online purchases, but perhaps more importantly, they can have a positive impact on the reduction of congestion and pollutants from urban freight transport. Needless to say, the implementation and efficient use of APLs require the support of local residents, delivery companies, local authorities and land owners where APLs are planned ^[69].

Examples of APL: DHL, InPost, ByBox, GeoPost and Chronopost

APL in Germany

Currently in Europe, the largest APL network is the Packstation network operated by DHL/Deutsche Post in Germany, with 2750 APL locations in the country (2014). Packstation offers consumers and small businesses the possibility to access their parcels seven days a week, 24 hours a day.

Customers are issued a PIN, an Internet password & a city plan CD-ROM showing all the Packstation locations. The system can also be used to make return shipments. A customer is informed of delivery by e-mail and/or SMS. Packages can be held for up to nine calendar days.

APLs can be used for packages up to a maximum size of 60 x 35 x 35 cm. The solution was first introduced in Dortmund and Mainz in 2001. Large companies (including BASF, Microsoft, Siemens Medical Services and SAP) have APLs on their premises^[70].

APL in the UK and Italy

InPost UK had 1000 APLs in operation by 2015 and is making headway with its plans to reach 2000 APLs across the UK.

InPost, a Polish company part of the private postal company Integer.pl Capital, aims to implement a full network of locker banks. Each InPost ALS is composed of between 47 to 72 individual compartments. Partnerships for locating the boxes include Morrison supermarkets, Esso gas stations and Toys R Us. Integer.pl also deployed 400 of its InPost parcel lockers in Italy under a new agreement with Italian e-commerce group Banzai in Rome, Milan and Turin. Overall, InPost today operates in 17 countries in Europe^[68].

APLs in France: the new Pickup Station network

GeoPost, a subsidiary of La Poste group, and Neopost, a manufacturer of postal equipment, have partnered and installed 100 (as a first step) APLs in the Paris region. At the end of 2016, one thousand APLs should be available throughout the country. In France, APLs are still rather uncommon. Pickup Station (the official name for that new network) lockers are being installed in areas of high traffic on everyday journeys (e.g. post offices, city centres, train, bus, subway, tram stations, and shopping centres). The Pickup Station lockers are also used by Chronopost (another company from La Poste group) parcels.

The Pickup Station lockers are available during work hours of train stations/shopping centres. Customers can pick up their parcels at any time of the day, after work or on the way from home to work or back. They have three days to collect^[71].

Challenges for some APL operations in the UK

Not all companies who have tested APLs have been successful. Some of them have failed at establishing and maintaining a large APL network. A recent example of challenges faced by APL networks is ByBox in the UK which decided to close its B2C operations in 2015, after seven years. ByBox now concentrates on field support for business and technical services^[72].

5.3 E-Groceries

Although e-commerce has been rapidly growing as a sales channel for the past decade, reaching and maintaining profitability has sometimes proven difficult. This is especially true for the online sales of grocery items segment. The specific properties of these products complicate the online selling. Firstly, many grocery items should be kept chilled or frozen, which makes them more difficult to deliver to the customer. Secondly, profit margins in the grocery business are generally quite low and many online shoppers are not willing to pay for the convenience of not having to go out to the shop and buy their groceries themselves^[73, 74]. Finally, grocery items are generally purchased frequently which implies that the ordering and delivery process should be as convenient as possible, as the average shopper must use these processes many times. Providing this convenience comes at a cost. Together, these properties make the online selling of grocery items a difficult task^[75].

In the late 1990s, pure internet players appeared in the field, but their low profitability forced most e-grocers to halt their activity or give up their independence.^[76] In the UK, the offer of e-grocery by traditional supermarkets started at the beginning of the year 2000. Then, Ocado and Tesco introduced e-groceries in the UK and all major UK grocers followed around 2006. Therefore, the UK is the European pioneer in e-grocery. At the beginning of the year 2000, online shopping for food was also marketed heavily in other European countries. But companies had more start-up difficulties there. Only two of the 13 e-groceries in France were ever profitable. Explanations suggest both cost-side and income-side determinants^[26, 77]. Some of the different e-commerce drive formats are shown in Figure 19 below.

Figure 19 Click and Collect External to a Store or as a Free-Standing Unit

PlanetRetail Source:[78].

In France, e-groceries are now mainly offered in combination with "Drives" (a click and collect form of online shopping with access primarily by car, also known as click and drive). There are more than 2000 Drives in France (as of 2016). Today, all French major actors of the food retail sector have entered the e-grocery market, mostly in combination with Drives^[26] (Figure 20 below).

In Germany, a revival of e-grocery started around 2009 when Rewe set up a drive-through concept in Cologne. In 2016, a new impetus to the German online food market was then added when Amazon announced that they would soon start entering the fresh food market in Germany by selling fresh food online. In the US, Amazon is the biggest provider of e-fresh food^[26, 79]. In February 2016, Amazon started selling fresh fruit and vegetables in Italy through its Prime Now service. For now, fresh produce can only be ordered online in Milan and 34 municipalities. These fresh produce items are available within a one- or two-hour delivery window seven days a week^[80, 81]. In June 2016, Amazon UK announced the launch of AmazonFresh for customers in 69 Central and East London areas with one-hour delivery slots^[82].

E-Groceries Example: Carrefour, Tesco, Ahold, Metro Group and Bonpreu

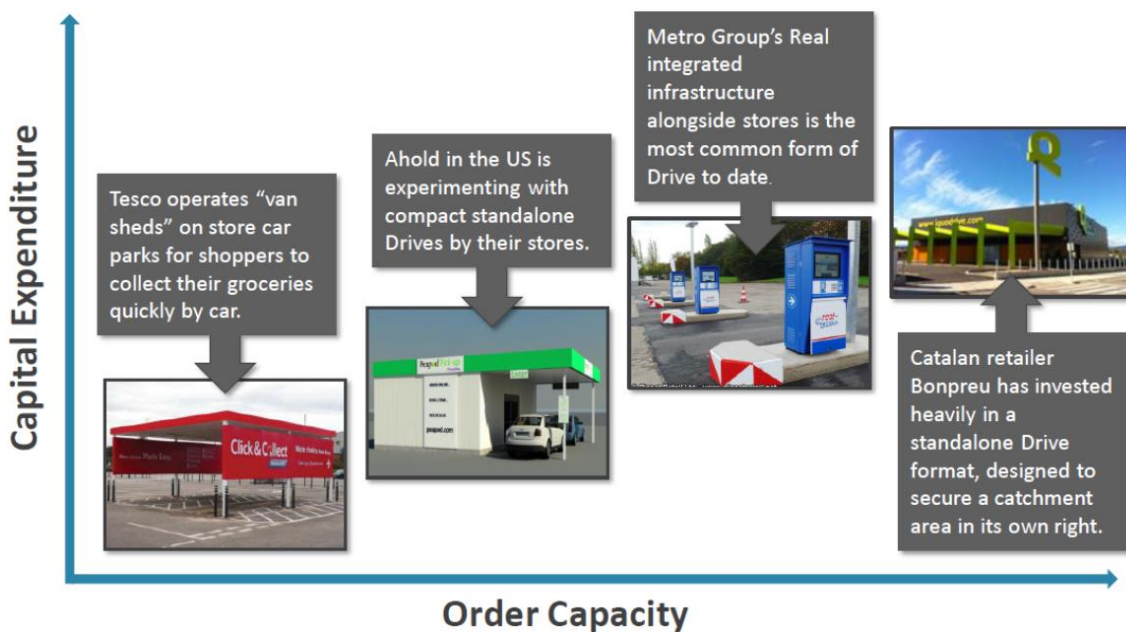
In addition to its home delivery service, Carrefour continues to expand its click and collect service, where customers can pick up their online orders in stores. Customers can shop online and have their order delivered, or collect it at the store or at a drive PP^[83].

Carrefour is fully committed to developing its click and collect services and plans to increase the number of click and collect points to 3000 across France, up from 600 at the end of its 2014 financial year. Carrefour is also introducing new features as it develops its online business, such as order online and collect within two hours in store^[83, 84] (Figure 20 below).

Figure 20 Carrefour Drive in France

Source: [85]

Different business models followed in Europe are shown in Figure 21 below^[78].

Figure 21 Drives - Different Business Models

Source: [78]

5.4 Key Factors for Delivery Collection.

The following factors are critical for delivery collection (PP, APL and E-Groceries):

5.4.1 Failed Deliveries

PP networks are emerging as one of the solutions to deal with failed first-time home deliveries^[86, 87]. A delivery policy which allows failed first-time home deliveries to be automatically directed to the consumer's nearest PP benefits all parties^[86]. In addition, when

PPs are located near residential locations (e.g. at local stores) or in areas that already generate consumer trips (e.g. petrol stations, railway stations), little additional travel by consumers will be required to collect a (failed) delivery^[88].

Rerouting a failed delivery to a PP also reduces the risk of theft of goods that otherwise would have been left unsecured outside the home or delivered to neighbours. Thus, by using a PP, product loss and insurance claims can be reduced because unsecured deliveries can be mitigated against^[49].

APL networks, in spite of the major investment costs they entail, they seem to be a promising solution, reducing missed deliveries and allowing for off-hour logistics operations^[89].

5.4.2 Carbon Footprint

In the case of consumer goods, especially groceries, products are often bought as part of a larger shopping basket. It is likely that consumers will still go food shopping despite ordering certain products online for home delivery. Nevertheless, a reduction in consumer travel by car is essential if the environmental benefits of e-commerce are to be realised^[27, 90-92]. In the case of complete substitution of the traditional shopping trip (consumer car travel) by van home delivery, vehicle-kms can indeed be reduced by up to 70%^[90, 93, 94].

5.4.3 Delivery Consolidation

Solutions such as delivery points can provide some degree of consolidation^[14]. Delivery companies delivering parcels to PPs provide possibilities of combining the delivery of parcels with the regular supply of goods to the store.

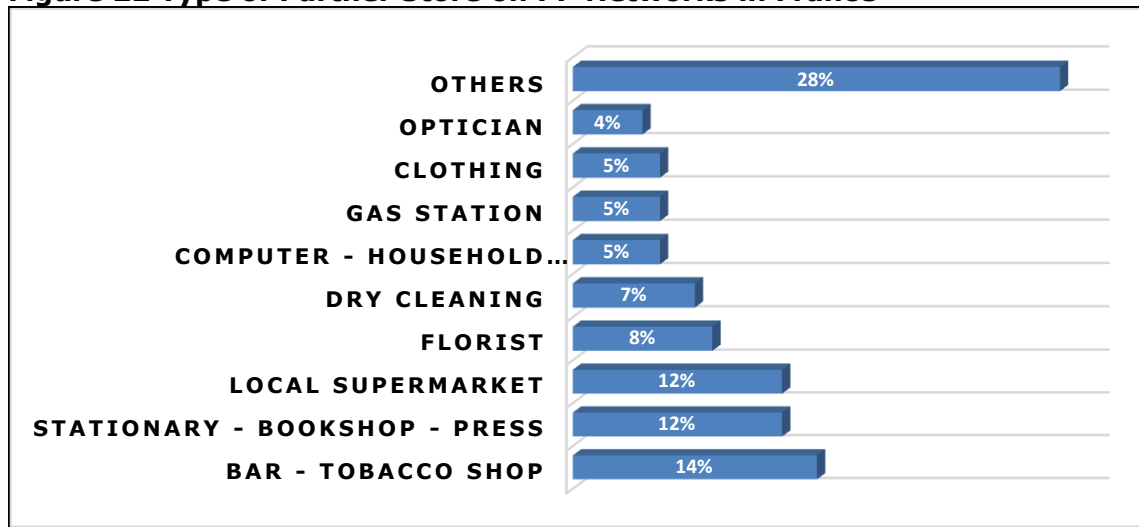
5.4.4 Freight Traffic in Residential Areas

Nowadays, policy makers acknowledge the potential of PPs and APLs as a means to reduce and restrain the expected growth of freight transport in residential areas caused by e-commerce^[60]. Besides yielding time and cost savings for consumers, carriers and retailers, PPs have other advantages.

Governments need to coordinate actions with the private sector in developing necessary logistics facilities including local PPs in order to restrain the expected growth in residential areas due to B2C e-commerce^[64].

5.4.5 Partner Stores

The type of partner stores that are included in the French PP network are primarily small independent local shops, such as florists, bars, tobacco shops and press kiosks^[56] (See Figure 22 below).

Figure 22 Type of Partner Store on PP Networks in France

Source: Own elaboration based on ^[56]

5.4.5 Accessibility

The success of PPs is largely determined by their accessibility. PPs with many consumers in their immediate surroundings also perform best. A walking distance or a five-minute driving distance by car seems to be the critical accessibility value for the success of this concept. Developing a denser network of PPs may stimulate the uptake of this concept by online shoppers^[87].

A study in The Netherlands^[64] shows that the more PP service points online shoppers can reach within five minutes by car from their place of residence, the higher the probability that they will use PP collection/delivery. It appears that people prefer to use this concept when PPs are located close to their residential location^[64].

It is worth noting that many PP sites are located near commuter railway stations. In Paris, railway stations are targeted as priority sites for identifying stores to be added to the PP networks. On average, the population is located 1.6 km from the nearest PP in French urban areas^[56].

PP networks all target the same type of location for new PPs: the most densely populated areas and transportation nodes (main train and subway stations, highway interchanges and road intersections)^[66].

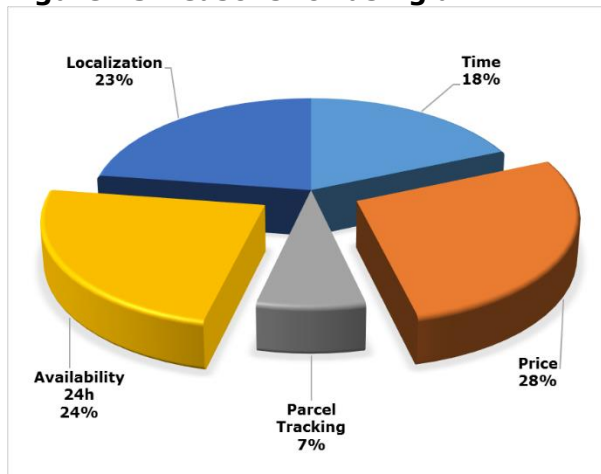
Efficient location of APLs in a city is a very important factor for their successful use^[95]. Best city locations are:

- Local 'hot spots' within suburbs, next to convenience stores in neighbourhoods with a higher density population.
- High traffic pedestrian areas in city centres.
- Shopping centres and supermarket car parks.
- Local commuting hubs, bus/subway/rail stations.
- Petrol station forecourts.
- Petrol stations.
- Business centres.

An assessment of the influence of location on APL efficiency was done in Szczecin, in Poland in 2012/2013 under the Green and Sustainable Freight Transport Systems in Cities Project (GRASS). After relocating five underperforming APLs to new, better-suited locations, it was observed that deliveries increased by 32%. The highest delivery growth was achieved in the case of an APL close to shopping centres.

Moreover, a survey performed on internet shoppers identified that the three most important factors for using an APL were price of delivery, availability and location (see Figure 23).

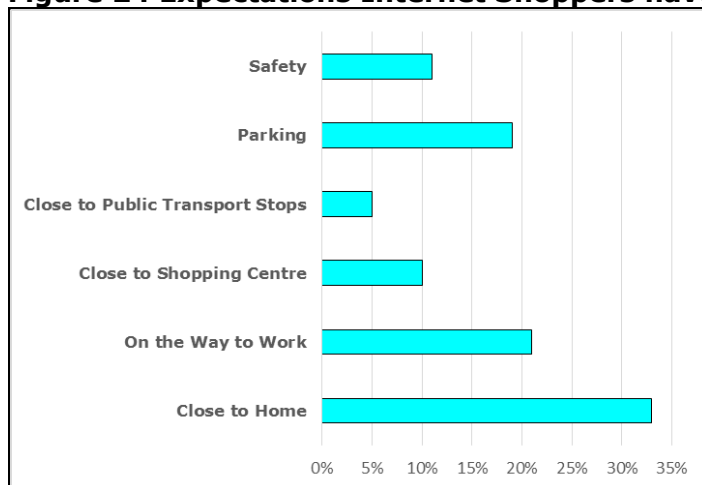
Figure 23 Reasons for using an APL



Source: Own elaboration based on ^[69]

Internet shoppers' expectations regarding APL location were: close to home, on the way to work, and availability of a parking space^[67] (See Figure 24).

Figure 24 Expectations Internet Shoppers have from APL Location



Source: Own elaboration based on ^[67]

5.4.6 Shift from Personal Travel to Freight Transport

Most shopping trips undertaken are for groceries. As such, e-groceries are likely to lead to a shift from personal travel to freight transportation.

Shopping trips represent approximately 13% of the total energy use for passenger transport in Sweden, and there are similar metrics in other European countries. However, the impact of e-commerce on personal shopping trips does not appear significant. Although a particular shopping trip may be substituted for by an online purchase, overall travel behaviour with regards to the total number of trip lengths remains largely unchanged for online shoppers.

An average consumer visits a grocery shop 2.2 times a week and 82% of online shoppers have bought grocery online instead of visiting a grocery store^[96]. Customers are reluctant to accept delivery fees despite their negative feelings about the time taken and distance driven to do shopping. This represents a significant drawback for e-grocers who incur costs when delivering products^[77].

Other factors negatively influencing consumers' decisions to purchase groceries online include the need or want immediate delivery of products. More frequent instant deliveries will generate higher freight traffic but reduce individual shopping trips and thus may reduce emissions.

5.4.7 Delivery Solutions E-Groceries Depend on Customer Habits

There is no 'one-size-fits-all' approach for online food retailing. Consumers in the UK and France shop more regularly for food online than Germans. Whether this is related to the wider online grocery offer in the UK and France or to consumer behaviour or is rather a result of both is not yet clear. Experience to date shows that food shopping via the internet often complements traditional shopping^[26]. A difference in consumer behaviour can also be considered: German households spend around 11% of their total consumer spending on food and non-alcoholic drinks, whereas French people spend around 13%. also Differences occur regarding food e-commerce^[26].

5.4.8 Institutions and Government

Governments will need to draw up new policies, management approaches, rules and regulations for the future, so that all companies can take advantage of new technologies without affecting residential areas and city sustainability.

The EU regulations on the hygiene of foodstuffs (EC) No 853/2004^[97] and 853/2004^[98] outline requirements for the transport of food and specific requirements such as Hazard Analysis and Critical Control Point (HACCP) principles. (EC) No 853/2004 requires that adequate transport systems be in place to ensure that food remains safe and suitable for human consumption and delivery.

Even if food is already packaged for transport, requirements differ from those necessary for non-food products. The various products must be treated differently on their way to the end customer, regarding sensitive handling for some products or cooling where necessary; for that reason, goods must be packaged in separate boxes. Furthermore, all fresh products need special storage and rapid handling and transport. The shift from day to hour deliveries offered by most e-grocers constitutes an increase in logistics complexity^[26].

APLs are often situated in public spaces, and, as such, it may be more difficult to establish an APL network as often a permit from the local authorities is required to place an APL on a public site. Moreover, because of their location in public spaces, APLs are more sensitive to theft of parcels or vandalism^[88].

5.4.9 Time-Constrained Households

Evidence suggests that the more time-constrained households are, the more likely they will be to use PPs, APLs, Smart Boxes, E-Groceries or last-minute On Demand Delivery: the more hours of (paid) work in the household, the lower the likelihood of using Home Delivery, except for instant home deliveries (for evening dinner for example). This indicates that especially for households where no one is at home during work hours, other logistics schemes are good alternatives to home delivery^[64].

A great number of people are looking for opportunities to save time in everyday routines, and grocery shopping can be one of them. Online grocers and multi-channel retailers are trying to adapt to this development. Aiming, for example, at employed parents, e-grocers place their Drives in business areas to attract customers during the journey between their workplace and their home^[77].

The mode of delivery, or the last mile issue^[99], may be the crucial barrier to e-grocery as a viable business model^[76, 100]. Either customers can pick up their orders from a warehouse or store, or the goods can be moved from the retailer's site to the customer's home. Direct home delivery of groceries is gradually becoming more attractive to busy professionals and families, which means this model needs to be explored further.

Chapter 6 Barriers and Enablers of Logistics Schemes for E-Commerce

Barriers and drivers for policymakers to better accommodate and regulate urban freight transport related to e-commerce are numerous. Those related to externalities are shown in Table 5 below. They have been identified during research and are divided into six groups:

Laws and regulations. The main barrier is that it is hard for local authorities to implement regulations if not supported by their national government. For larger cities, one possible explanation could be that the laws and regulations regarding emissions are addressed to another department of the authority (e.g. environmental) and that delivery workers do not see the direct connection to freight transport operations. Further possible explanations could be a lack of sanctions.

Insufficient infrastructure is mainly connected to a lack of sufficient curb space, lack of adequate urban warehouses (fulfilment centres), delivery areas for loading/unloading activities or the barrier of moving a vehicle into an urban area due to congestion or narrow roads.

Lack of funding is mentioned as a major barrier to the implementation of innovative and sustainable schemes for e-commerce urban deliveries, such as the use of clean vehicles. However, the funding issue should not be considered important since results show that most measures fail to continue after project funding ends. This motivates the discussion of the importance of finding a business case for each measure that is implemented. Nevertheless, funding is almost always necessary in a starting phase.

In the *political and cultural category*, issues of knowledge and involvement emerge. The local authority organisation contains individuals and those individuals affect the situation in general. Knowledge of how logistics and freight transport work is low and the personnel working at the local authority offices have little or no education on this subject (dealing with "issues"/solve the problems that occur). The lack of knowledge and awareness is mainly concerned with political, cultural, practical and technological factors and impacts. The problems that arise involve insufficient support from politicians and general policy-makers, insufficient personnel resources, relatively low awareness of possible activities, insufficient knowledge of how to start activities, low awareness of freight transport impacts and a lack of statistics. There are very few cities that have a person dealing with freight transport and even fewer that have personnel dealing solely with this question.

Table 5 Barriers and Drivers of Innovative Logistics Schemes for E-Commerce

	Barriers	Enablers
Laws & regulation	Local authorities need support by national government to set own regulations	Emission standards Maximum emissions for urban areas (European Legislation)
Infrastructure & land use	Insufficient infrastructure Insufficient knowledge of logistics activities in land-use planning Focus on passenger transport in planning	Lobbying from transport operators and other stakeholders (not necessary with a sustainability perspective though).
Financial	Lack of funding	Financial instruments like EC projects Engagement from local businesses Finding a business model
Political & cultural	Business problem (e.g. "the market will solve the problem") Focus on passenger transport Lack of interest Lack of knowledge Lack of stakeholder involvement Insufficient support from politics and general policies	Obvious need (e.g. Weight restrictions in sensitive areas of old towns) An engaged person working with the issue Stakeholder co-operation
Practical & technological	Lack of known solutions Lack of communication Lack of dissemination of earlier activities Lack of knowledge of how to start measures Unwanted side effects of activities performed	Best practices that show a good result Awareness of possible measures Knowing how to handle problems
Impacts	Lack of statistics and facts of impacts Lack of incentives to deal with impacts	Need for reduction of emissions Need for safety improvements on streets

The lack of interest has been raised, or implicitly mentioned, by many local authorities. This could be explained by several other barriers, like the "market will solve the problem" or the lack of knowledge –expressed as a lack of interest. The lack of interest, as well as many of the other barriers, could also be strengthened by the barrier "lack of support from politicians and policy-makers in general".

When it comes to *practical and technological barriers and drivers*, unwanted side-effects of urban freight measures are a barrier towards sustainable urban freight transport. A possible driver is for local authorities to be made aware of possible measures. For this reason, transfer of knowledge between cities becomes important, to share both successes and failures that could help other local authorities to overcome these barriers. This could also help the local authorities to overcome the barrier that there is a lack of knowledge from their side in how to start implementing a measure.

Finally, the *impacts of urban freight transport*, either from specific single measures, or act as a clear barrier when it comes to the available data. Drivers need to reduce emissions (e.g. NO_x, particulate matter and noise) but congestion and safety are also important issues that are often raised, together with quality of life and attractiveness of the urban area. However, the barriers are large in this area and the lack of data is noticeable.

When considering the different factors presented in the table above, the barriers are by far more relevant than the drivers, since it seems that the lack of interest and knowledge most affect outcomes. This lack of interest and knowledge is a potential reason for the lack of initiative regarding urban freight transport from the local authority side. It is not as simple as saying that the drivers are the opposite of the barriers. Some cities lack (in a positive sense) some of the barriers and have become more successful, due to the greater availability of drivers.

Cities that have an engaged person working with freight transport are the cities that have demonstrated the greatest effort in finding solutions to reduce the negative impact of freight transport in the urban area. A good example of this is the case of Gothenburg in Sweden, where the one person responsible for freight has succeeded in improving stakeholder involvement resulting both in good dialogue and understanding of different issues and in outcomes in terms of an improved freight transport situation in the urban area. Here it has been shown that a “driving spirit” is very important.

Chapter 7 Conclusions

Governments will need to draw up new policies, management approaches, rules and regulations for the future, for all companies, and cities, to be able take advantage of new technologies such as ODD, or delivery using drones, without affecting residential areas and city sustainability.

1. Local authority knowledge and awareness of how logistics and freight transport work due to e-commerce should be increased.
2. Three points that emerge as valuable for small and medium-sized cities are:
 - An increase in awareness and training to achieve better knowledge of the freight transport area
 - Knowledge transfer and interaction between cities and stakeholders
 - Cooperation with other, preferably neighbouring, cities.
3. Freight transport in urban areas caused by e-commerce is a business interest. However, the local authority needs to implement regulations and policies which affect the logistics parameter and the decision makers and therefore needs to understand both the cause-and-effect of such measures and how the outcomes could be optimised.
4. By adopting an urban perspective (transport planning, land use and wider urban planning), in complement to rather than opposed to a transport system or network approach, planners and local authorities would have a better understanding of how to address freight movements due to e-commerce and the implications for their interaction with urban activities. Interesting in this respect is that the European Commission's TEN-T framework gives a particular role to urban nodes as part of wider logistics networks.
5. Decision makers need to consider combinations of data collection methods to identify the best way to tackle the issue in their city. A thorough ex-ante evaluation is necessary to make the outcome of the implementation more valuable as well as to show the actual impacts.
6. Other measures available to policymakers to help reduce the environmental impacts of urban freight transport caused by e-commerce include the encouragement of the use of electric and hybrid freight vehicles (with hybrid vehicles switching to a non-polluting power source near sensitive locations such as near schools, hospitals and densely populated areas), and the introduction of lorry routes to keep heavy goods vehicles away from more sensitive locations.
7. It is important for a city or area to find an appropriate mix of different measures. Often the measures are used together, and the way a transport policy should be conceived and implemented should be carefully evaluated. Several concepts will require a change in behaviour and thus awareness of the importance of change management is fundamental.
8. Making energy and transport more affordable and sustainable is one of the priorities of the Juncker Commission. Actions in cities are particularly important as urban transport is responsible for 23% of the EU's greenhouse gas emissions. Sustainable transport due to e-commerce is one of the highlighted essential components and it is recommended that local authorities develop and implement Sustainable Urban Transport Plans.
9. Considering an increase of freight traffic in residential areas together with externalities, policymakers would need to implement measures that make freight activity more efficient, with actions such as loading/unloading bays in residential areas.

10. The increasing use of fulfilment centres or urban distribution centres inside cities would encourage the use of sustainable methods of last-mile delivery such as walking, using bicycles, motorcycles, or electric vehicles. Support is needed from the local authority's planning department to dedicate land for these warehouses.
11. Implement Urban Vehicle Access Regulation measures in residential areas to regulate freight traffic.
12. Promote Automated Parcel Lockers in public spaces.
13. Where helpful, cities can support, as a kind of network manager, logistics operations with open-access infrastructure, for instance urban consolidation centres, tramway and other rail delivery, delivery by water, etc. In that respect, the European Commission's Connecting Europe Facility (CEF) can be of help to make urban logistics projects with a positive welfare-economic balance also have a positive private cost-benefit outcome.
14. Urban planners may need to influence or control the movement of freight vehicles. This can be done through for instance delivery time windows, congestion charging, and others.
15. The traditional method on transport planning is not useful in today's complex environment, where it is necessary to take the increasing effect of e-commerce and ensuing delivery complexities into account.
16. A model helps clarify the working process and to identify all the steps needed. Yet it is not the solution to all problems with urban freight transport. Both peer-to-peer meetings for knowledge transfer between cities and easily accessible information are essential.
17. Decision-making contexts are complex, difficult to change and time consuming. Vision, plans and consensus are important prerequisites for success.
18. Unsuitable policies regarding freight transport could have a negative impact on costs and effectiveness of the urban freight transport operations. Clear local authority policies on (urban) freight transport are needed.
19. Governments often struggle to balance regulation of private firms' activities against the need to leave operating decisions to firms, in order that competition between enterprises can support efficient outcomes. When considering further legislation, rules on competition should be considered.
20. Increasing the size of postal boxes to allow reception of parcels, changing from attended home delivery to unattended home delivery and obtaining the benefits associated with a reduction in failed deliveries whilst at the same time using the extensive infrastructure of National Postal Operators should be considered.
21. The increase in ODD services is leading to an unstable employment status for workers/employees, as the sector often applies maximum flexibility, in line with high- and low-demand moments. Labour laws must be amended in line with the new demands/needs. If maximum capacity utilisation of infrastructure is envisaged, also in cities, then legislation will have to cope with e.g. night labour in logistics, etc. This is something that cities do not control themselves, but which they can lobby for, eventually through their national associations, with higher-level authorities.

22. With private cars delivering goods in cities (crowd-sourced deliveries), tax and charging schemes may need to be reviewed, to allow the recovery of the externalities caused by cars carrying out parcel/goods delivery.

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