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How crowdsourcing is transforming the face of last mile delivery
'Crowd logistics'

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Abstract
Last mile logistics is the least efficient stage of the supply chain and comprises up to 28% of the total delivery cost. A variety of collaborative economy business models are rapidly emerging and growing across the globe, changing the way services were traditionally provided and consumed. They are driven by technological, economic and societal factors. Among the possible strategies that can be implemented to provide fast shipping services, there is crowdsourcing logistics. Crowdsourcing logistics is defined as the outsourcing of logistics services to a mass of actors.

Due to the scarcity of scientific literature and to have a better understanding of the industry, a multiple case study of firms operating in crowd logistics was conducted. First, seven elements that can describe crowd logistics business model were identified coupled with technologies enabling crowd logistics. Moreover, two main classifications were identified, the so called B2C and P2P companies finally it was indicated how crowd logistics impacts last mile efficiency.

Crowd logistics platforms enables individuals and other actors such as tech entrepreneurs and traditional logistics firms to offer new services. This creates new employment, flexible working arrangements thus helps smaller retailers to reach a wider market and customer base. Crowd logistics also make markets more competitive and efficient by improving matching between demand and supply. In addition to the role of mobile technology, societal drivers such as population density also appears to play an important role in the development of the crowd logistics. Increasing population density within cities has provided the basis for a critical mass which is the back bone of crowd logistics platform.

Keywords (crowdsourcing, crowd logistics, crowd shipping, sharing economy)

Abbreviations (CL- crowd logistics, B2C- business to consumer, P2P-peer to peer)

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1   Introduction

For many years, businesses ran on a straight forward manner; manufacturers manufactured, logisticians distributed, and customers bought goods. Recently, people have begun to drift to a new model of consumption, where temporary access to goods and services is preferred over actual ownership. There is a new breed of digital companies driving this significant shift. There are companies controlling supply systems and own only the IT user interface. (DHL trend 2017)

It is now clear that the business world is going through radical changes. The world's biggest provider of accommodation and hospitality services Airbnb does not own any rooms, and the world's biggest taxi service Uber does not have any cars. These two vastly growing billion-dollar businesses are model companies of the new era. These companies leverage digitalization in creating solutions that enable smarter and more efficient use of resources. (Rougès, 2014). Both Uber and Airbnb have demonstrated that online platforms can be used to coordinate access to private assets.

This concept is often referred to as crowdsourcing. Many Authors (Seebaueer, 2015; Bocken, 2014) claim that Crowdsourced transport could be one radically different solution for the worldwide problem of unsustainable car transport in terms of personal mobility in general and, more specifically, related to shopping. Thus, crowdsourced delivery could contribute both to absolute reduction in natural resource use and sustainable product-service systems.

In fact, information technologies have transformed passive consumers into active participants in services. In particular, crowd logistics enables anyone to easily exchange products, services or other resources with their peers. The ability to perform matches between offers and requests in a marketplace accessible to a broad segment of the society allows economies of scale and high efficiency by increasing the level of utilization of resources (Bocken, 2014)

1.1   Motivation

This thesis was chosen out of own interest in the sharing economy and logistics. Crowdsourcing already has a strong presence and unquestionably is going to consolidate and grow. It is important for companies and managers to know what it is truly about, how they can take advantage of it. The hope is to support stakeholders in understanding this trend, so that stakeholders can maximize the opportunities within the online sales and delivery market.

1.2   Objectives

The research is carried out to examine the existing literature related to crowdsourcing logistics and its application in the ecommerce, especially in the last mile delivery. The ultimate aim is to have a general overview on about this topic and understand the existing body of knowledge, identifying the possible gaps and predicting which could be the future research direction of this subject. To have a more comprehensive and deeper understanding of the topic, there are two main objectives

1. To critically explore new opportunities in crowd logistics for future supply chains.

2. To understand the benefits of crowdsourced delivery for the stakeholders in the industry.

1.3   Research questions

1. Can the successful technology and business model in passenger mobility and hospitality industries be applied in delivery of goods?

2. What are the technologies enabling crowd logistics?

3. How does crowd logistics impact last-mile efficiency? Is it possible to reduce delivery times, cost and environmental pollution?

4. Why would people be motivated to take part in crowd logistics?

1.4   Thesis layout.

This thesis is organized in six chapters. The authors introduced the topic, described the background, motivation, objectives as well as presented the research questions in this first chapter. The research context, methodological approach, data collection procedures and how data were analyzed were justified in the second chapter. Next, a systematic literature review covering related themes with respect to the thesis subject took place in the third chapter. Here, different practical cases of crowd logistics were studied. In chapter four findings of the study were interpreted based on the literature review and the multiple case study. Summary of key findings, study implications, evaluation of study limitations as well as conclusion and outlook formed the fifth chapter. Finally, a list of references was presented in the sixth chapter.

2   Research

The aim of this thesis is to explore the approach that crowdsourcing goods delivery platforms use to realize network effects. It represents conceptual work that builds on a literature review enriched with an in-depth analysis of real-world examples in the field of crowd logistics. A synthetized framework is presented in the systematic literature review section, to explore how a combination of technological, networking, pricing and motivational strategies are applied to the crowdsourcing platforms that concentrate on last mile delivery.

This research will mainly consist of studying secondary data sources. Government publications, technical documents, annual reports of the companies, logistics books, papers, publications, scientific articles and blogs.

2.1   Research context

This study explores strategies used in various crowdsourcing platforms organizing delivery of packages, groceries, restaurant food and library books. The companies do not deliver the goods by themselves instead they provide a platform that matches

users who need any goods delivered with those who are willing and able to deliver them. These case companies have slightly different business models. Most of the companies crowdsource their deliveries to private individuals, one company exploited a large pool of part-time employees and another uses a combination one professional drivers and private individuals.

However, what is common for each of these case companies is the ability to raise money in form of investment. Considering the amount of money pouring into these startups, it is not surprising to see how fast crowdsourced delivery market is growing. In the same fashion, they all operate in multi-sided market that is, connecting at least two distinct participant groups (B2C or P2P). Important to realize, all the case companies are less than ten years old, and different sizes, they range from those still operating with seed capital and in one city to those funded with millions of dollars and operating internationally. Another key point, the companies are spread all over the world, in different geographic locations in North America, Europe and Australia.

In general, crowd logistics is still a niche market, where the best practices are still explored and that is characterized by several entrants experimenting with different business models. The emergence of these companies is mainly driven by mobile technologies, innovative applications in social networks and increased start-up funding. Crowd logistics represents only a section of the growing collaboration economy currently led by transportation and hospitality giants Uber and AirBnB respectively. These two giants are perfect examples of how crowds can be exploited for business. Many retailers have turned to crowdsourced delivery options to alleviate the stress of last mile deliveries, and in turn, have turned their stores into mini-warehouses. The industry is still in its infancy and the players are facing several complications and legislative constraints (DHL Trend, 2017).

2.2 Methodological approach

Multiple case study method was chosen to conduct the research. Several prominent authors have contributed to methodological developments, which has increased the

popularity of case study approaches across disciplines (Denzin & Lincoln, 2011; Merriam, 2009; Ragin & Becker, 1992; Stake, 1995; Yin, 2003,2009). Case studies have been largely used in the social sciences and have been found to be especially valuable in practice-oriented fields (such as education, management, public administration, and social work (Mills, 2010) According to Yin (2003) "the distinctive need for case studies arises out of the desire to understand complex social phenomena" because "the case study method allows investigators to retain the comprehensive and meaningful characteristics of real-life events," such as organizational and managerial processes, for example. In fact, case studies seem to be the preferred strategy when "how or "why" questions are being posed, when the researcher has little control over events, and when the focus is on a contemporary phenomenon within some real-life context (Yin 2003, p 5-10).

According to George and Bennet (2005) case studies allow for the identification and measurement of the indicators that best present the theoretical concepts that a researcher wants to measure. Many of the variables that the author is interested in, such as new business opportunities, motivation, present and future of last mile delivery etcetera, are difficult to measure, so the author must carry out a "contextualized comparison," gathered from different cases, which automatically models and assesses complex causal relations even if they are expressed in different terms and contexts.

Although this thesis is based only on ten companies, they provide basis for generalizable theory. Findings derived from a case study can be generalized to other situations through analytic generalization (Yin 2012). Analytic generalization is based on study's theoretical framework to establish a theory that could be applicable to other situations. Multiple cases and, for instance, literature review enable the access to explore these relationships. Yin (2003, p.47) states that "multiple case studies can be used to either, (a) predict similar results (a literal replication) or (b) predicts contrasting results but for predictable reasons (a theoretical replication)". Overall, the indications are therefore that the evidence created from this type of study is considered robust and reliable.

2.3   Data collection procedures

Data collection was carried out through desk research based on an extensive literature review. According to Buldeo Rai (2017) desk research is a sure and reproducible method for identifying, evaluating and synthesizing the existing body of completed and recorded work produced by researchers, scholars, and practitioners. Due to the uniqueness of the topic "crowd logistics" Literature was found using Google Scholar, which is a free and vast database was well suited for researching this relatively new topic. Furthermore, the author used online databases such as ScienceDirect, research gate and Web of Science that yielded additional material. Several keywords were used and are listed in the abstract section above. The literature search thus provided a result of reliable documents.

The search strategy targeted journals, companies' websites, scientific publications, book chapters, project reports, white papers, magazine articles, FAQs and blogs. Although most research is based in Europe other found regions include USA and Australia. By reviewing the available literature on crowd logistics, the author believes to have captured the information that is available to date.

Description of the crowd logistics business model is based on the collected information from case companies. An investigation was launched on the selection of case companies with vast exploration of giants in the crowdsourcing delivery environment in different geographic markets. Finally, more than thirty potential case companies and an array of different business models were identified. The intention was to find at least eight companies that used technology platforms in organizing deliveries of goods and by operating as intermediaries between individuals and the consumers who needed something delivered. The aim was to get a coherent sample of case companies according to Eisenhardt's (1989) instructions on the theoretical selection of cases. In the view Eisenhardt a number between 4 and 10 cases usually works well. With fewer than 4 cases, it is often difficult to generate theory with much complexity, and its empirical grounding is likely to be unconvincing, unless the case has

several mini-cases within it. On the other hand, with more than 10 cases, it quickly becomes difficult to cope with the complexity and volume of the data.

Many potential case companies were identified followed by a selection of high-level outline of companies' business models based on archival data such as companies' web sites and media articles to be able to categorize them and confirm that they were indeed crowd logistics platforms instead of traditional delivery services. Different kinds of companies were identified most of them generic some operated in the e-commerce industry while others delivered food from restaurants. One of the startups conducted a trial in the public sector by using crowd logistics system. Deliveries were done either from library to home or as return deliveries to library. A comparative table enabled the identification of when the companies were founded, amount of investments each of the companies has attracted and respective core business. Furthermore, comparison with literature on the Physical Internet to assess the application of the successful technology in mobility and hospitality industry and position the crowdsourced delivery concept and its direction

Finally, the process led to a desirable coherence. A scope of ten companies from different categories were identified: three crowdsourced grocery delivery platforms, one crowd shipping company, where the focus was on long-distance deliveries, two local crowd shipping companies, where the focus was on deliveries within a city, two traditional delivery businesses exploiting new delivery method businesses and the other two are generic delivery platforms. This group of case companies represented an ideal sample for theory development. It provided a variety of distinct cases and examples from the industry of crowdsourced goods delivery platforms:

2.4   Data analysis

The qualitative desk research data was analyzed following Yin's, 2003 instructions on building theory from case study research. According to Yin, data analysis means a search for patterns in data collected. Yin states that once a pattern is identified, it is interpreted in terms of a social theory or the setting in which it occurred and that the

qualitative researcher moves from the description of a historical event or social setting to a more general interpretation of its meaning. The multiple case analysis involved detailed examination, categorizing, tabulating, or otherwise recombining both quantitative and qualitative evidence to address the objectives set and initial research questions. In line with the objectives, insights derived from literature enabled discovery of patterns, building theory and more importantly, conclusions were constructed. The data was then organized around certain topics in the finding sections, addressing key themes, objectives and research questions.

3 Systematic literature review

3.1 The online market overview

Not alarmingly, clothing and footwear sales will continue to dominate largest online volumes, growing by almost 50% between 2013 and 2018. By 2018, food orders are foreseen to rise above deliveries and downloads of books (Barclays, 2014). A result of this trend will be that supermarkets and online grocery retailers will need to lay the groundwork for a progressively competitive and busy online market and ensure that their delivery methods are ready for increased volumes.
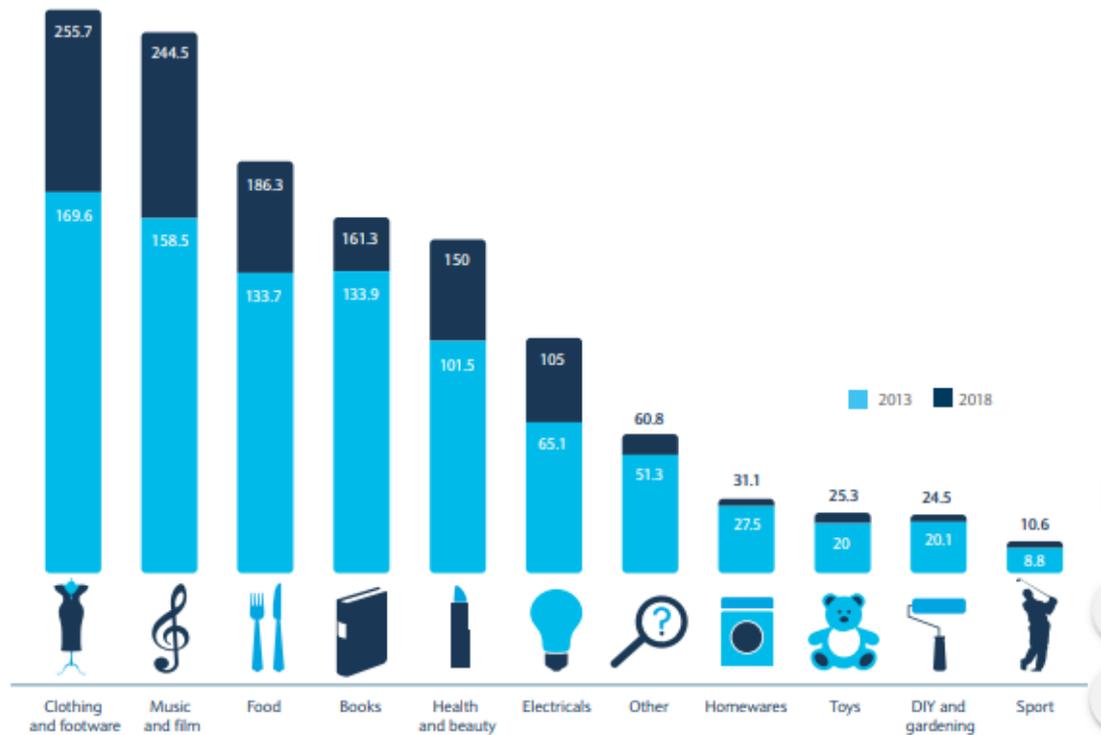
Figure 1: Total number of deliveries generated by online orders by product type (2013-2018) (millions)

Source: Barclays

With this increasing volume of e-commerce activities, retailers are under pressure to provide speedy, quality product delivery to customers (Barclays, 2014). At present, many retailers offer their customers the options of home delivery and store pickup/smart lockers. Last mile delivery service, in which the purchased products are delivered to the doors of consumers, is presently requested by the majority of online customers. (ibid)

Last mile delivery is one of the largest challenges in Business to Customer e-commerce. The last-mile element of the delivery model currently accounts for up to 55% of shipment costs, (Holden, 2017). Holden stresses the challenges associated with last mile delivery such as pollution and speed. Consequently, this issue has become one of the bottlenecks of e-commerce (Wang, 2014) Last mile delivery transportation

activities negatively impact the environment. The transportation of goods, using service delivery vehicles, results in social, economic and operational impacts on the urban transportation infrastructure.

Last mile product delivery is a crucial part of the supply chain of a product, and it can impact the relationship between retailers and their customers. Speed and cost are the two factors that are crucial to the success of last mile delivery (Chen and Pan, 2015) to prosper, it is very important for companies to be ahead of, or on par with, their competitors in their quest to reduce costs and improve operational efficiency, many companies try and test out different approaches to last mile delivery.

The capacity of the systems providing 'last leg' delivery to the home will have to expand enormously to cope with the predicted growth of online retailing. This statistic below provides information on business to consumer e-commerce sales worldwide in 2012 through 2018. Online sales are forecast to increase from $1.05 trillion ($10^{12}$) in 2012 to around $2.36 ($10^{12}$) trillion by 2018(E-Marketer, 2016).
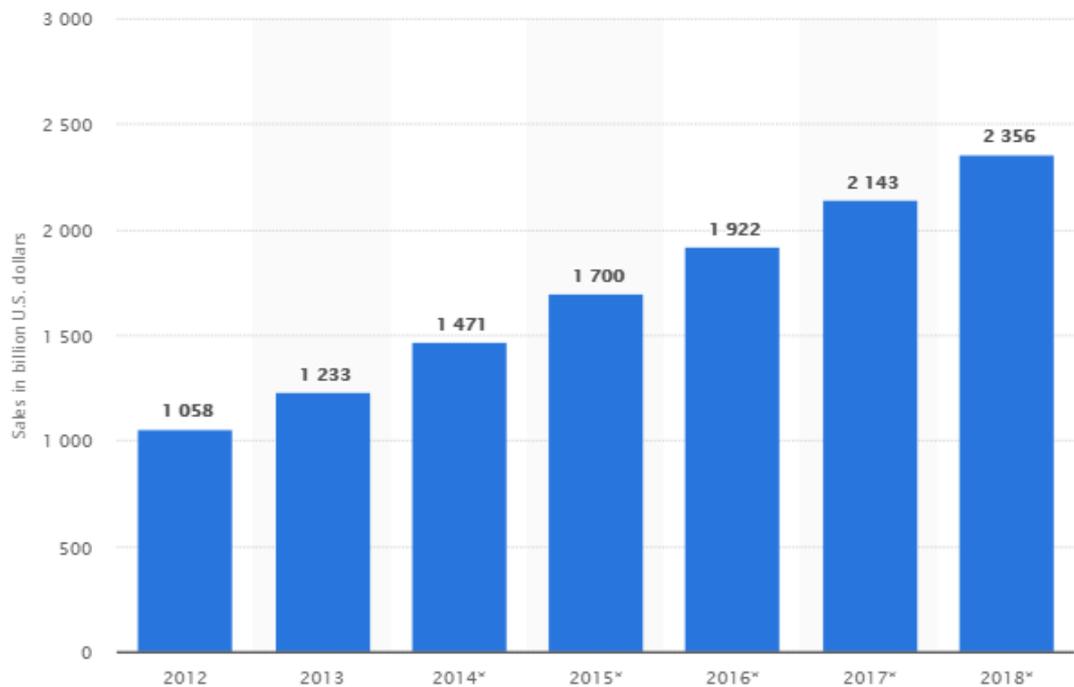
Figure 2: Worldwide Ecommerce sales 2012-2018

Source: Emarketer.

As a result, there is an increasing amount of research being carried out on the use of crowdsourcing as a hope to resolve the ever-increasing logistics issues in urban areas. (Mehmann, 2015)

3.2 Delivery options

When it comes to last mile delivery, small and medium-sized businesses and in particular local shops have different options. First, the most automatic option is to deliver goods on their own. However, such businesses often are too small to implement an efficient delivery network unlike Amazon, Walmart, these cannot leverage economics of scale. Consequently, delivery is inefficient, time consuming and costly. A

second obvious solution is to outsource the delivery to a professional delivery company like posti, DHL, ups etc. At a glance, this seems like a good option because the responsibility is shifted to another party however, the downsides are either too long delivery times or comparatively high costs either for business or the customer depending on the business policy.

Drones are now being used to deliver parcels in a matter of minutes, thanks to pioneering efforts of companies like Amazon. Drone delivery is especially useful for hard-to-reach areas since aerial vehicles are used to transport the items. However, drone delivery has certain limitations. For instance, regulations by authorities, only suitable for lightweight products and being available only in selected areas. As soon as these limitations are worked out, drones may become a regular part of delivery services.

Robots are here as well, they are used to deliver goods to customers of local businesses in some areas. The unmanned robots are fitted with cameras and sensors to enable them to navigate around roads and streets.

A Cambridge university based Mole solution proposes taking delivery services underground using a network of train tracks. Road deliveries are prone to delays due to traffic. As a workaround to this problem, this concept of delivery, called the Mole, can transport multiple quantities of goods to their destinations, which are mostly suppliers and businesses. In the future, the Mole might also be able to deliver single packages to customers' houses.

Crowd logistics is quite a recent topic, this thesis focuses on this emerging 'new and innovative' crowd based option for delivery. Such platforms have been approved in hospitality and passenger transportation and is now transferred to general transportations as well. A competitive delivery market is driving stakeholders to continuously review delivery options with investment in technology and innovation. This innovation uses modern communications technology to connect merchants with regular people who want to avail of their delivery services. This thesis analyzes aspects and challenges of such a delivery platform.

3.3   Definition of crowd logistics

Crowd Logistics has its origin in the term crowdsourcing. Crowdsourcing is a combination of the words "crowd" and "outsourcing" (Howe, 2008), whereby "crowd" is defined as a mass of people and "outsourcing" describes the shift of processes, functions and duties to third parties.

There is no commonly agreed upon definition of the concept Crowdsourcing. It is the Information Technology-mediated engagement of crowds for the purposes of problem-solving, task completion, idea generation and production. Likewise, there is no agreed upon definition of crowd logistics. Recently, the term was defined as "an information connectivity enabled marketplace concept that matches supply and demand for logistics services with an undefined and external crowd that has free capacity with regards to time and/or space, participates on a voluntary basis, and is compensated accordingly" (Howe, 2006).

Crowd logistics relates to the idea of a network, along with the global sharing economy trend. Crowd logistics is a concept for freight transportation, aiming to improve efficiency and sustainability of the way physical objects are moved, stored, supplied and utilized across the world by applying concepts from internet data transfer to real world shipping processes. To put it in another way, Crowd logistics relates to a network because technology enables passengers to use the capacity in their vehicle more efficiently, by carrying parcels for others. This makes CL also part of a larger trend of sharing, termed as the collaborative or sharing economy, which according to Buldeo Rai is a fast-growing sector disrupting mainstream industries. (Buldeo Rai, 2017)

3.4   How does crowd logistics work?

Crowdsourcing has a sharing platform business model. A sharing platform is either an online or physical platform that facilitates the sharing of resources and decreases the overcapacity of assets. To put it in another way, the excess capacity is people's time

and mobility. Crowd logistics enables individuals and businesses to tap into the already existing mobility to get items delivered.

This is a good example of utilizing the power of IT and the internet to create new ways of organizing human activities. By creating a crowdsourcing platform, a new marketplace is created where the supply and demand of mobility and time can be matched. In this business model the service is mostly yielded by the crowd and not by the staff of the company. The persons within the crowd either demand or provide a service whereas the company acts as a mediator. The mediator is responsible for the coordination and therefore provides an IT platform capable to track communication, manage master data and fulfil payment transactions.

For instance, a standard software application consists of two parts, one for each user group: A web application targets the service seeker who could be anyone for example owners of brick and motor shops while a mobile application either for (iOS/android) targets the transportation driver (people who deliver the packages). The Platform requires registration for all users the requester as well as the transportation driver. The registration connects the users by providing basic details. Once the users are registered, then they get an email as a confirmation for registration and a link to verify their account.

The service seeker can then login with his/her credentials with the web application and add a transportation request that meets his/her requirements. The seeker can add details about their transportation request which includes important details like the dimensions of the item, the pickup, destination location and the deadline. If the transportation driver has a verified account, he/she can login with his/her credentials with the mobile application and view the transportation requests nearby as well as details regarding the request. The user voluntarily chooses whether to accept the request or not. Once the transportation request posted by the requester is accepted by the deliverer, a notification email will be sent to the service seeker. This will confirm that the transportation driver has accepted to deliver the good.

To demonstrate, when a consumer has bought some goods from a IKEA online, the individual (service seeker) submits a delivery service request online or via an app and wants an item delivered, the crowdsourced delivery platform sends the confirmed order details to available approved 'couriers' in the territory of the dispatch point. Just as the way Uber application works, the first courier to accept the delivery task secures the job.

The potential of Crowd Logistics can also be seen from various successful companies, for instance the taxi service Uber, the last mile delivery service trunkrs or the service Wolt which provides same-day delivery of online purchased food from restaurants. Couriers receive remuneration in return. Figure 3 & 4 illustrates how the crowd sourcing system works.
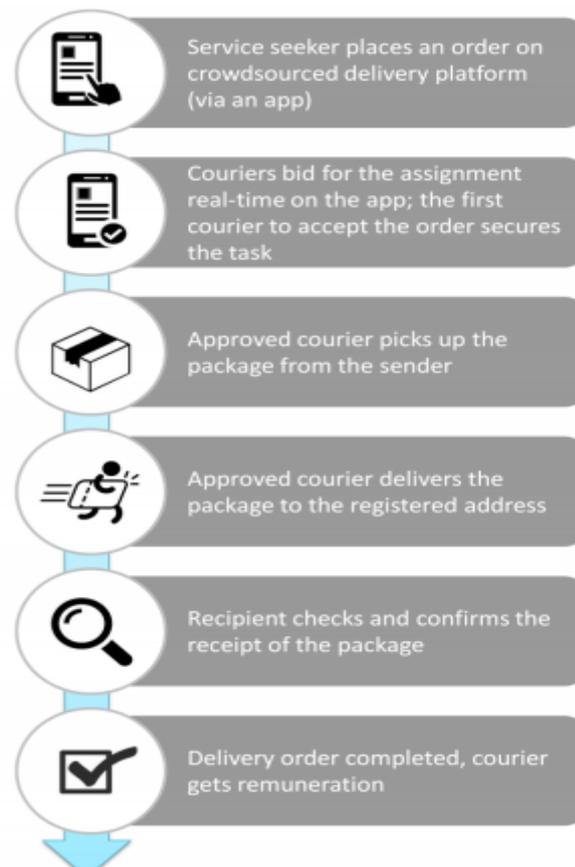
Figure 3: How crowd logistics system works.

Source: Fung Business Intelligence Center
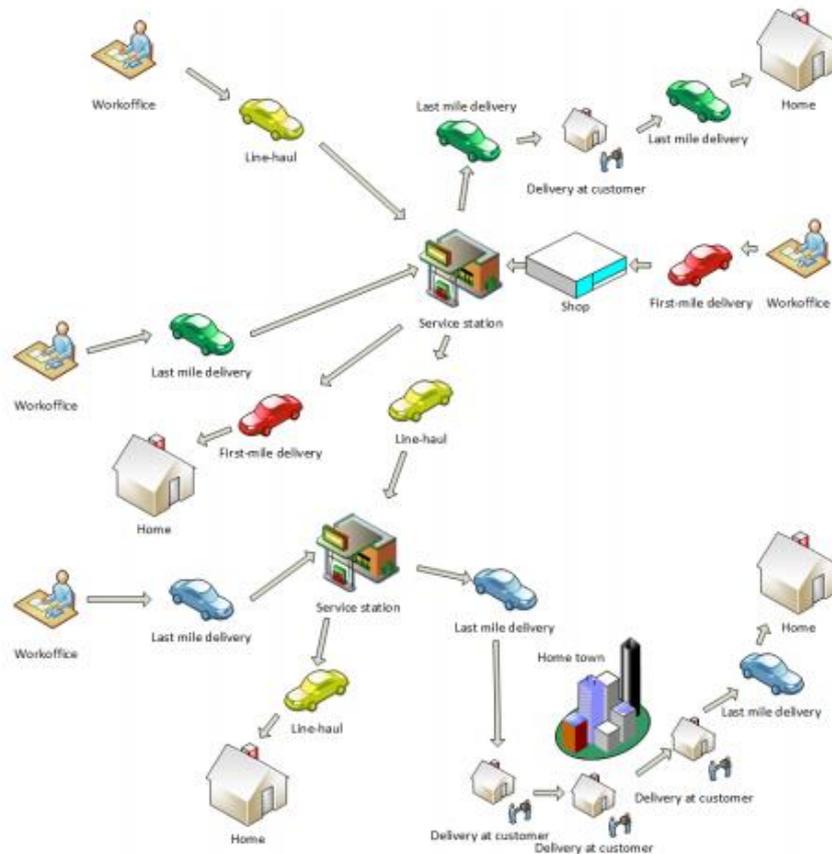
Figure 4: Schematic view of CL distribution network

Source: https://pure.tue.nl/ws/files/46946377/855853-1.pdf

Kafle (2017) proposes a two-tiered crowdsourced delivery system. In the first tier, trucks are used to transport goods from distribution centers to a relay location and the second tier is crowdsourced. In that second tier, cyclists, pedestrians, drivers relay parcels from trucks and fulfill the last mile of the delivery. In the system, the carrier posts pickup and delivery requests on a platform and individuals bid to carry out a subset of those requests. Relay points are locations where parcels are transferred between a truck and private individuals. The company decides on the winning bids and plans the truck routes that visit the relay points and delivery addresses of requests for which no bids were received (or for which the received bids were too expensive). Kafle (2017) continues to argue that Compared to a pure truck based solution, this system can provide significant cost reductions.

3.5 Crowd logistics in business

This concept can be traced back to DHL's foundations. In its early days, DHL offered free plane tickets to private travelers in exchange for giving up their baggage allowance to transport critical documents needed to clear ocean freight cargo at the destination. In this way, DHL allowed the original bill of lading documents to arrive long before containerized ocean shipments made port, a problem at the time where containers were increasing the speed and volume of ocean freight. Once on the ground, a network of couriers brought the documents to their final destination. (DHL Trend research 2017)

Today, it is time to modernize the concept of crowdsourcing in logistics facilitated by advances in information and communication technologies. With increasing online purchases, retailers are under pressure to provide speedy and quality delivery of products (Barclays, 2014). Most retailers are looking out for innovative ways to deliver their products more efficiently. What crowdsourcing brings to the table is a technology platform that brings together unorganized individuals to offer their services. Crowdsourced delivery means that drivers, commuters, bikers deliver goods to each other along their way or during their free time to earn some extra money. Ideally, the deliveries would be made with minimal detour, along the way.

One of the most crucial and highly researched topics currently is how to solve logistics issues in urban areas using Crowd Logistics. As an example, Zalando, a German e-commerce company, relies on Trunkrs to offer same-day-delivery for its customers in certain cities in Europe. Trunkrs uses crowdsourced delivery, but also established courier services. Uber is also an example of a successful crowd logistics provider. (DHL Trend 2017)

In addition to these e commerce companies that provide home delivery, restaurants are now becoming major players. Historically, pizza shops for example have commonly offered home delivery, the majority of restaurants have not. However, the rise of crowdsourced delivery options now provided opportunities for other restaurants

that were reluctant to enter the delivery market to offer home delivery. In fact, it is a trending necessity for restaurants to remain competitive.

As a Consequence of crowd logistics, environmental benefits are envisioned as one of the main benefits of crowd logistics. Crowdsourced delivery, allows for a better utilization of transportation capacity, by promoting consolidation and coordination of existent vehicle flows enabled by the IT platform, potentially reducing congestion and greenhouse gas emissions, as it can reduce the number of vehicles dedicated to delivery of goods as in the traditional method.

"We claim that crowdsourcing is the most effective way to an absolute reduction of resource use and environmental impacts in the transport sector in the short term. Car manufacturers are improving transport fuel efficiency pushed by tightening policies concerning climate change" (European Commission, 2010)

Despite growing interest in applications of crowd logistics, few studies exist investigating the many challenges that need to be resolved before a full realization of the concept can be achieved. The objective of this thesis is to provide an overview of applications of crowd-sourced logistics services, and also point out and discuss some of the relevant issues pertaining to the deployment of such innovative systems and their impact and relevance for city logistics. Recent studies reported by Paloheimo suggests that successful implementation can also result in reduction in pollutants emitted by delivery trucks.

3.6   Growth of crowd logistics platforms in Finland and EU

A variety of collaborative economy business models are rapidly emerging and growing across Europe, changing the way services are traditionally provided and consumed. They are driven by technological, economic and societal factors. Collaborative platforms enable individuals and other actors such as micro entrepreneurs and (small) businesses to offer services. This creates new employment, flexible working

arrangements and new sources of income and helps small businesses reach a wider market and customer base. They also make markets more competitive and efficient by improving matching between demand and supply.

3.6.1   Wolt

Wolt is an online food ordering and delivery service that takes orders via a mobile app. The company is based in Helsinki, Finland, and currently expanding throughout the Nordics and Baltics. It was launched in 2015 in Helsinki and has since expanded to seven countries across Europe (Sweden, Norway, Finland, Denmark, Estonia, Latvia, Lithuania). According to wolt.com, the company has achieved more than 700,000 registered users, employs over 130 people and partners with over 1400 restaurants. 2,000 couriers. Wolt allows any restaurant to sign up as a merchant, mediating the order from the customer, taking care of the delivery through crowdsourcing and automatic payment by credit card. Customers chooses a restaurant on the Wolt app and places an order.

with only a couple of clicks, you inform when the order will be ready for pickup. In the background, the Wolt system pairs the order with an available courier. A courier picks it up from the restaurant and brings it to the customer's door. Couriers make deliveries by bicycles, scooters, motorbikes, cars and in certain cities by walking.

Wolt has managed to raise funding from some of the prominent names in European technology world, including Kees Koolen, Partner at EQT Ventures and former CEO of Booking.com, Ilkka Paananen, CEO of Supercell, Niklas Zennström, Founder of Skype, and Risto Siilasmaa, Chairman of Nokia. Other key points, wolt received some appreciation and recognition from apple by awarding them the Editors' Choice, Wired named them one of the "Hottest Startups in Europe," Forbes included the CEO Miki Kuusi on its list of 30-under-30 in Consumer Tech, and the Nordic Startup Awards named us Company of the Year (Wauters,2018)

3.6.2   Coreorient

A Finnish company called Coreorient was founded in 2011. Coreorient is a company that is involved in developing services and technologies that help people get everyday things done more efficiently while using less time. The company's flagship service, PIGGY BAGGY, is a crowdsourced ridesharing service for goods. Piggy baggy is the pioneer of crowd logistics in Finland. Piggy Baggy, matches customers with delivery needs to drivers who use their own cars, trucks, bicycles, or even public transit to pick up and drop off packages. By the end of 2015 the service had over 1500 users and between 700 - 800 items delivered (Ovaska, 2016). A pilot with K-City market and Lahti City offered senior citizens a possibility to order their grocery shoppings home via telephone. In addition to door to door Drop-off and delivery also takes place at "smart" containers distributed among the city's public spaces.

CoReorient was selected as the only Finnish candidate among 30 semi-finalists in the 2016 European Social Innovation Competition. The semi-finalists were selected from the 1095 applicants and all semi-finalists received support to progress their ideas. Coreorient has been involved in many projects all around Finland. Consequently, the company conducted experiments in Helsinki, Tampere, Jyvaskyla and Lahti, The largest, third, seventh and eighth largest cities in Finland. (Statista, 2016). in the Lahti City Center launched its "Order & Pick-up" service for online orders, it decided to offer a delivery option with PiggyBaggy, a peer-to-peer delivery. In a short time, 100 enthusiastic citizens had registered to do the deliveries. During the testing period, the delivery was free for customers and Citymarket payed a 5 € fee for the volunteer drivers

Based on these experiments it can be inferred that their systems and main concepts work. It must therefore be recognized that the experiments enabled Coreorient to test different assumptions about the markets and their customers, which helped the company to refine its ideas and services. Armed with this experience, Coreorient is

now looking outside Finland, Europe and beyond. Multiple sources suggest that Finland is getting small for Coreorient, and potentially Denmark and India reported to be the likely candidates.

3.6.3 Trunkrs

Trunkrs is a package delivery company that seeks fulfill the rapidly increasing need for 'Same day delivery at affordable rates' through a crowd sourced parcel delivery community. The uniqueness of the business proposition lies especially in the way Trunkrs exploits a network of qualified crowd sourced commuter drivers to perform the distribution from city boundaries to consumer homes. The process works as follows: As in the current situation, a professional pick-up driver collects parcels and transports them to a transfer hub. The transfer hub stores the parcels and hands them out to so-called 'commuter delivery drivers'. These commuter delivery drivers are commuters linked to Trunkrs, earning a fee per package for delivering the package. Therefore, costs and emissions of extra delivery rides are cut, and Trunkrs doesn't need to subcontract its delivery activities anymore.

3.6.4 PiggyBee

Brussels-based startup PiggyBee was launched back in 2012, and boasts a fairly wide following. Unlike other startups, deliverers don't always receive a monetary compensation for their services. Instead, the platform encourages users to trade transport, accommodation, or local advice. Originally user base was European, there is now a wider international community.

3.6.5 bringr

Belgian post group launched a new collaborative platform app, called bringr, which enable users to source drivers who can transport goods for them. The collaborative system runs parallel with its already existing traditional delivery system. The

crowdsourced delivery service enables users to find a driver to pick up goods at point X and deliver them to point Y. People can use the app both to request deliveries and register as drivers. The price for the service is calculated based on various parameters, such as weight and distance, payment is made electronically through the app.

3.6.6 Sennder

A German company that offers same-day parcel delivery by using extra space in the luggage compartments of long-haul buses. The company uses only existing infrastructure, including for security screening. It has partnered with one of Europe's largest long-distance bus operator, FlixBus, as well as city couriers and strategic shops where packages can be dropped off. The first route was Berlin-Hamburg, and during the first month of operation, approximately 1 000 parcels were delivered door-to-door. The target clients are e-commerce players and businesses, as well as private individuals.

3.6.7 Baghitch

A Swedish company that matches drivers either on the road or planning a trip with people who need various bulkier objects delivered, such as furniture. Drivers and senders agree on a date and time for pick up. Prices are fixed and freight insurance is included for up to SEK 2 500 (about 250 euros). Both drivers and senders rate each other after the experience. The company has approximately 1 750 members up to date, with 150 active drivers in Sweden, and has just started operation in neighbouring Denmark.

3.7 Growth of crowd logistics platforms outside EU

Many crowdsourced delivery startups, like Deliveroo, Go people, and Deliv, have emerged around the world, and have collectively attracted a lot of billion dollars in

investment. This again shows that the topic Crowd Logistics is of great interest. Each works in a slightly different way, but they all follow a similar idea, that is "Uber/Airbnb" model" for executing deliveries and meet customer expectations.

3.7.1   Go People

As it says on the official website, 'Deliveries made simple, cheaper, faster and smarter' Founded in 2014, Go people is a Sydney-founded crowdsourced courier startup, the company currently operates across Sydney, Melbourne, Brisbane, Perth and Adelaide will soon be expanding to other cities in Australia. raised $3 million in funding as it looks to grow further in the increasingly-crowded delivery startup space. The service works by having a customer book and pay for a delivery online or via Go People's app, with couriers then able to apply to take a job, and the nearest or otherwise most suitable runner chosen. According to GoPeople.com it has over 23,000 runners on the platform, delivering over 10,000 parcels each month. Go people provides the following feature for its' customers. Go People users benefit from GPS transparent tracking, back up runners, and instant communication from pick-up to receipt. Delivery verification and signed confirmation is assured. Other solutions provided by go people can be shown below.

Picture 1: Go people features

Source: https://www.gopeople.com.au/

3.7.2 Deliv

Deliv provides a new last mile delivery solution to power same day delivery for retailers and businesses. Deliv has no inventory and no fleet of vehicles. This is the reason why Deliv can provide the service at relatively low fee in comparison to competitors. Another way in which Deliv differentiates itself is that it sells the service to stores and malls instead of directly to customers. Deliv partnered with malls because over 85% of the largest retailers are located in malls. By doing this, Deliv created its own distribution network (Halzack, 2012).

Service seekers can integrate Deliv into thier ecommerce site or simply book a local delivery. Deliv currently partners with some 4,000 retailers to help them offer same-day delivery services to rival those of Deliv serves over 4,000 businesses: they include "25 of the US'retailers," e-commerce companies, local businesses and traditional parcel carriers such as Best Buy, Bloomingdale's, BloomThat, Fry's Electronics, K&L Wine Merchants, Office Depot, PetSmart, Macy's, Plated, and The UPS Store.

Picture 2: Schematic of deliv delivery network

Source: https://consumervaluecreation.com/2016/03/10/same-day-delivery-with-crowd-logistics/

3.7.3 Amazon flex

Amazon's own crowd sourced delivery platform, Amazon Flex, which was introduced in the year 2015, a crowdsourced delivery for Amazon.com, Amazon Fresh, Prime Now and Amazon Restaurants; which means regular people could spend a shift delivering packages, groceries or dinner. Currently amazon flex is in more than 50 cities and still growing. Amazon pays regular people drive to their facilities, pick up packages and deliver them to their customers. When drivers sign up for their shifts, they will be directed to a location near them to pick up packages that must then be delivered to a customer. Being a Flex delivery driver is similar to being an Uber driver but instead of driving people, drivers deliver packages.

The Amazon Flex App is a mobile app provided by Amazon that makes being a Flex delivery agent super-efficient. The Flex App is what all delivery drivers use to set

their schedule, load packages and give directions to their delivery destinations. Drivers can also view all their earnings, payment dates, and set their bank deposit preferences.
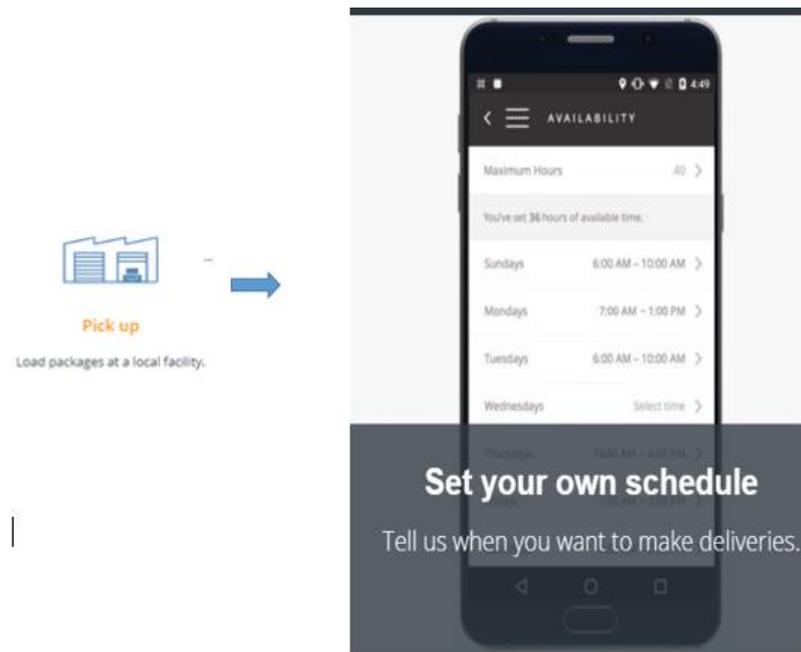
Figure 5: Driver's own schedule

Source: Amazon flex official website

To Deliver with Amazon Flex, you will need a reliable and working motor vehicle. If you are in New York or other select cities, they allow you to deliver with a bike but most cities you need a vehicle. If you are delivery Amazon Prime orders, you are allowed to use any vehicle that can safely transport the Amazon package. For normal Amazon.com orders, you will need a 4-door sedan or larger vehicle. Smaller cars and trucks with open beds do not qualify as they can allow items to be damaged. Amazon even allows you to use a rental or borrowed car as long as you maintain all permits

required, insurance, licensed and any other necessary authorizations to use the vehicle.
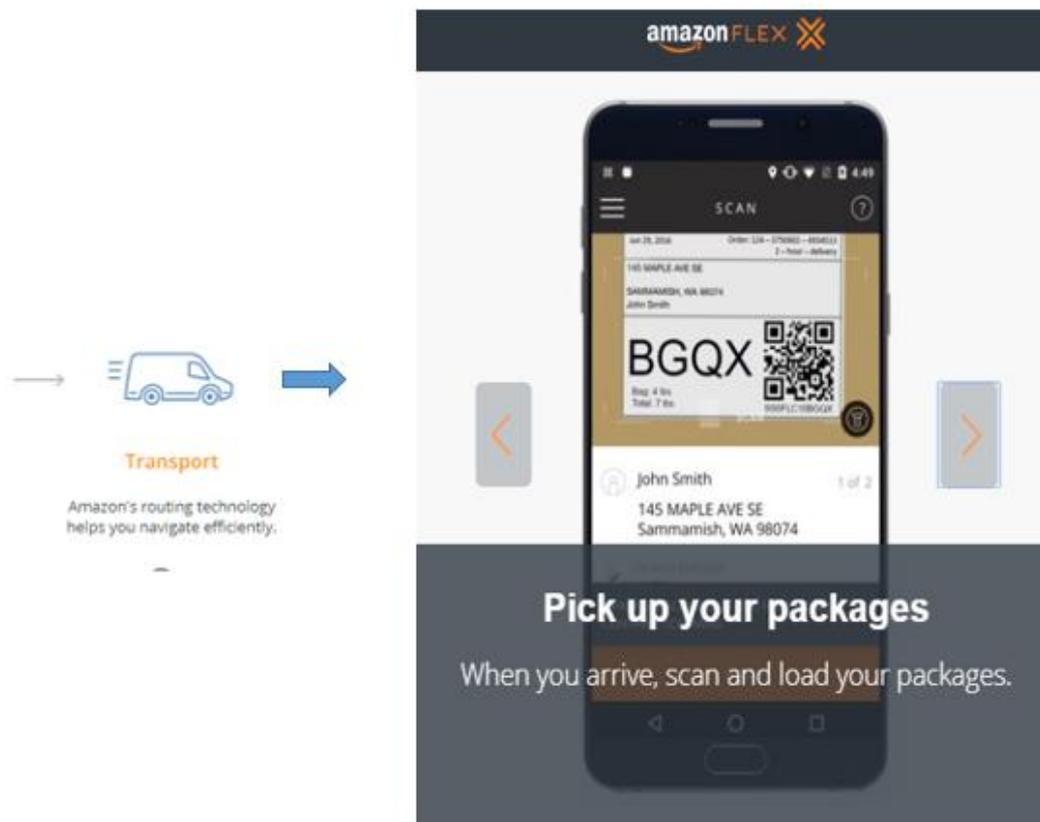
Figure 6: Scanning and loading packages

Source: Amazon flex official website.

Amazon Flex is a new way people can make extra cash delivering packages for Amazon. According to amazon flex official website, drivers earn $18-25 per hour to deliver packages out of their own cars. Drivers can make up to $25 per hour by using a larger car, which makes it possible to deliver more packages.
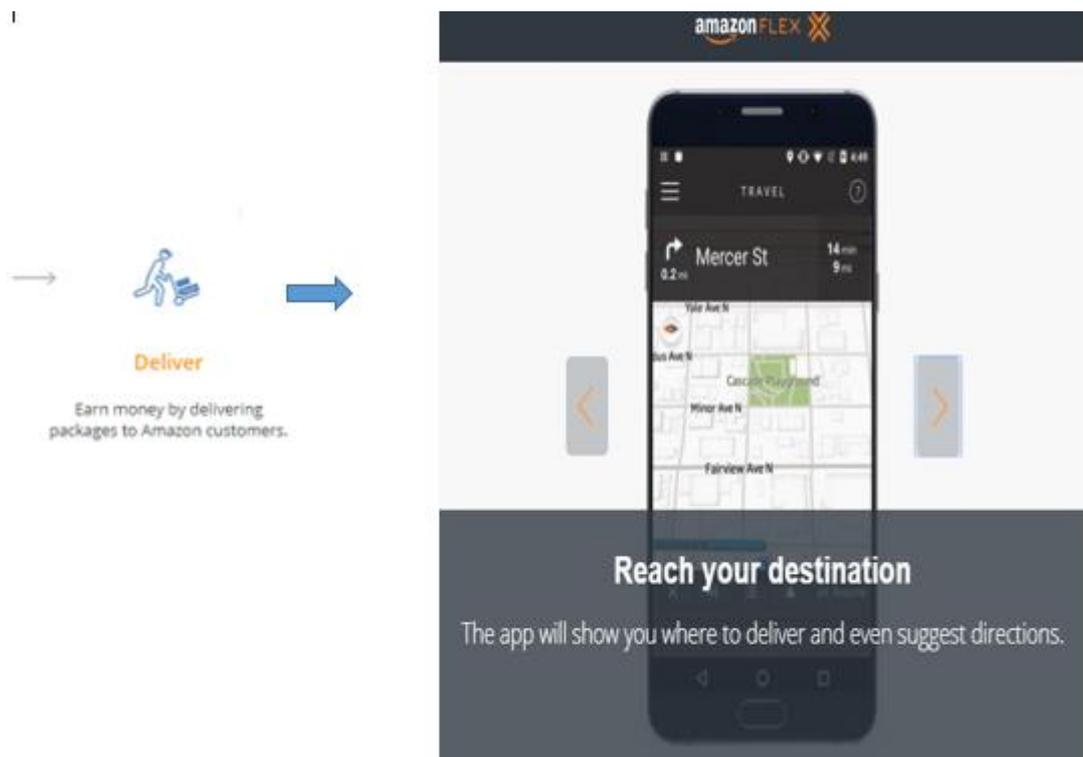
Figure 7: Routing

Source: Amazon flex official website.

Other popular store-to-door delivery initiatives are found in the grocery and food service industry, where the platform provider not only arranges the delivery service, but also acts as store front and allows its customers to select the retailer/restaurant from which they want to purchase. Instacart, for example, offers same-day grocery delivery for products bought at grocery stores selected by the customer. This is also typical for meal delivery services, UberEats and Foodora wherein couriers pick up a meal at the restaurant selected by the customer and deliver it to the customer's home.

4   Findings

Businesses have always changed with the times, but the access to technologies such as mobile, social media, cloud, and Big Data analytics has accelerated the pace at which today's last mile delivery is evolving and the degree to which they transform ecommerce industry. It is fair to say that Uber and its industry peers have been game changers. It has changed the way individuals get from point one point to another. If you simply don't own a car, or visiting in another town, visiting another country, or want a safe way to get home after a night in the town. The mobile application controlled cab alternative has become something useful. Uber has provided an insightful blueprint on how to bring service providers and clients together.

one of the objectives for this thesis was to find out if the "sharing economy" approach really work for both people and freight? The development of "uberization" for shipping solutions seems to suggest the answer is yes. This trend is getting its momentum. It can be assumed that the growing number of crowd sourcing logistics startups in the recent years suggests that the interest in this subject is increasing. Grocery and food delivery services like wolt, deliv also prove it possible. Amazon, a hybrid of the two service types will deliver both products and food in their ever-widening coverage areas.

In the last mile delivery field, crowd shipping is seen and listed among the possible innovative remedies, which could be implemented in the future, with other transportations innovation that will reshape the home delivery landscape in the following years

Table 1: Crowdsourcing logistics companies' structure.

Company	Firm Type	Classifica-tion	Origin	Year founded	industry	Area of operaion
Wolt	startup	B2C	Finland	2015	Grocery	Interna-tional
coreorient	startup	P2P	Finland	2011	Generic	Interna-tional
Trunkrs	startup	B2C	Nether-lands	2014	Ecom-merce	Interna-tional
PiggyBee	startup	P2P	Belgium	2012	Generic	Interna-tional
Bringr	Tradi-tional	B2C	Belgium	2016	Generic	National
Sennder	startup	P2P	Germany	2015	Generic	National
Baghitch	startup	P2P	Sweden	2014	Generic	Interna-tional
Go people	startup	P2P	Australia	2014	Generic	Urban areas
Deliv	startup	B2C	USA	2012	Ecom-merce	Urban areas
Amazon flex	Tradi-tonal	B2C	USA	2015	Ecom-merce	Urban areas

4.1   Elements of crowd logistics platform

Some recurrent patterns can be found in these cases even in these cases. Following the systematic literature review the author identified six aspects that are vital for the success of crowdsourcing logistics, in an attempt to establish a thorough understanding. These attributes are: -

1. Crowd
2. Digital Implementation
3. Compensation
4. Voluntary
5. Delivery time
6. Company type
7. Goods type

4.1.1 Crowd effect

The first dimension is the crowd, it refers to the group of individuals that are asked to undertake the task. This element is present in all the case companies, this can be people who do this during their spare time or commuters. The power of crowdsourced delivery is based on the network effect. A critical mass of couriers is needed to ensure fast, flexible and cheaper delivery. Equally important a critical mass of customers is needed to attract couriers.

4.1.2 Digital implementation

All the case companies have a means of an accessible platform is critical through which orders are coordinated, that is demand and supply for logistics services. These platforms can be accessed such as by mobile phone or web browser. Amazon for instance has the Flex App is what all delivery drivers use to set their schedule, load packages and give directions to their delivery destinations. Drivers can also view all their earnings, payment dates, and set their bank deposit preferences.

4.1.3 Compensation

All crowdsourcing logistics case analyzed provides remuneration for their workers, for instance Business to consumer platforms like amazon and wolt pay in two main ways; either scheduled hours and earn a guaranteed hourly rate or simply log online when available when you want and earn per delivery depending on kilometers covered. On the other hand, Peer to peer platform like Coreorient peers can just agree by themselves. Overall, it can be concluded that an adequate compensation is an essential element of crowdsourcing logistics. The monetary incentive given to the crowd is principally parcel based but still few companies pay on an hourly based.

4.1.4   Voluntary engagement

Engagement of the crowd is voluntary, meaning that people self-select logistics services they wish to fulfill. Given the absence of a fixed contract, the users can discontinue the use of the platforms at any time.

4.1.5   Delivery time

The time is an important component on the delivery service. A key characteristic is that they ship in short times and mostly in urban areas. Delivery windows for wolt for example is an average of thirty minutes. Sennder offers same-day parcel delivery by using extra space in the luggage compartments of long-haul buses. Deliv, a "crowdsourced" same-day delivery startup that currently partners with some 4,000 retailers to help them offer same-day delivery services. The most promising start-ups for example Deliv, Trunkrs are already making deliveries within hours.

4.1.6   Company types

The crowd logistics industry has been observed to be made by different kind of companies. The industry is mostly dominated by startups that specialize in this field, however, established online companies, like Amazon, Walmart, and Uber now showing interest and are also investing in crowdsourcing.

4.1.7   Goods type

The crowd logistics industry has been observed can transport almost anything and everything ranging from food, electronics, mail etc. Wolt for instance specializes in restaurant food, Baghitch the Swedish company specializes in bulkier objects like furniture. Generally, oversized and overweight goods are more expensive than standard ones.

4.2   Technologies enabling crowd logistics.

1. Mobile Devices

2. Digital Payment Infrastructure

3. Location Services

4. Verified User Profiles and Online Reviews

5. Communication application programming interfaces and Platform-specific Algorithms

4.2.1 Mobile Devices

According to Statista, the world will be moving closer to three billion smartphones users globally. It is becoming more and more difficult to imagine a world without the convenience of mobile apps. For the first time in 2015, Chinese consumers made more purchases through mobile phones than computers. As of 2016, two-thirds of digital purchases were mobile based (Forbes). Across ten countries worldwide, the average smartphone user has 27 apps installed on their smartphone, with some countries like Sweden, Switzerland, and South Korea averaging almost 40 apps per smartphone. (DHL trend 2017)
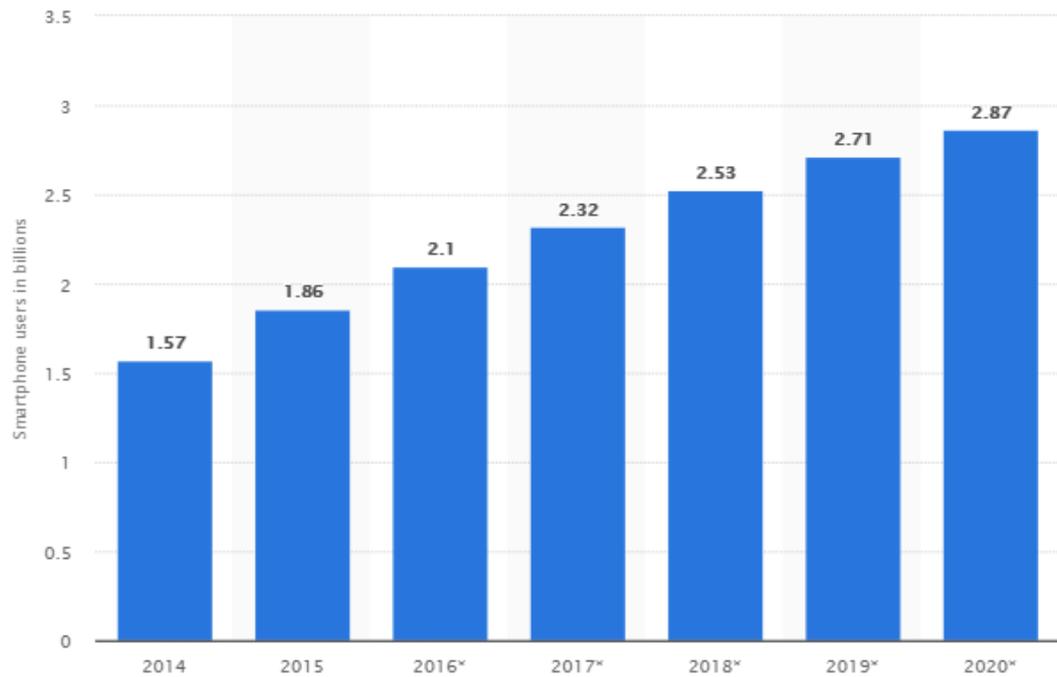
Figure 8: Number of smartphone users worldwide from 2014 to 2020 (in billions)

Source: Statista

Furthermore, mobile apps are becoming a generally accepted shopping and transaction interface. As mobile devices continue to represent a greater share of e-commerce transactions globally, users will be more likely to engage in the crowd logistics activities as most of the platforms that enable it are built around mobile usability experiences.

4.2.2   Digital Payment Infrastructure

The digital payment landscape is changing both online and offline at a brisk pace. Brick-and-mortar consumers are pushing retailers for an easier and more seamless way to pay using NFC and magnetic communication and online consumers are looking at alternative payment options including emerging payment service like bitcoin and other cryptocurrencies. This enables secure online payment via stored credit

card or bank account information. Digital payments will likely continue to be a catalyst for digital innovation in the coming years and may have a significant impact in how the crowd logistics industry as a whole evolves over the next decades.

4.2.3   Location Services

The universal availability of personal mobile devices combined with the devices' awareness about their position for example using GPS or WLAN positioning techniques) offer new potential to the concept of (location-based) crowd logistics (Howe, 2006). Based on an individual's location, a wide range of information and services may be offered to the individual to enhance his/her crowdsourcing experience Real-time location tracking provides security and transparency in the crowdsourcing logistics platform. This is enabled by the combination of mobile phone GPS sensors, software operating system-level location services, rich mapping apps such as Google and Apple Maps. For instance, Go People users benefit from GPS transparent tracking, back up runners, and instant communication from pick-up to receipt. Amazon makes being a Flex delivery agent super-efficient. The Flex App is what all delivery drivers use to give directions to their delivery destinations.

4.2.4   Verified User Profiles and Online Reviews

Technology behind identity verification services are constantly evolving, concurrently balancing two factors: security and user experience. These form a basic pillar of any online marketplace, as they establish trust and transparency across a distributed network of buyers and service providers (DHL trend 2017). The users create an account when they sign up with the crowdsourcing logistics platforms, or leverage an existing social network profile such as Facebook, Google, or LinkedIn by using a third-party login feature then followed by verification. For example, as part of the Services, Go people Application provides the Senders with the opportunity to review and rate the Runners whom they have engaged previously in order to assist other Senders to as-

sess whether they want to engage a particular Runner and to assist Go People in determining which Runners to assign to the Senders. The reviews and ratings will be listed on the respective Runner profile for view by Senders and recipients of goods. The Senders may rate the Runners on a three-point scale: Good, Neutral or Bad. The rating for a Runner will then be calculated as an aggregate of all ratings provided by the Senders Review and Rating System.

4.2.5 Communication application programming interfaces and Platform-specific Algorithms

When using crowd logistics marketplace, both individuals and companies, may advertise jobs and tasks and in return they are provided with a list of "individual-task matches Such a matching list may be generated either by a matching algorithm or by an auction model where first come first served where individuals may choose from a pool of offerings. Examples of such algorithms include the matching of a rider and driver, service listings ranked by lowest price, rating, etc. To enable this, again at the developer layer, application programming interfaces from third-party software developers allow basic communication features such as messaging and phone calls to be integrated to the platform apps. For example, when you are interested in crowd logistics service, the messaging between your phone and the driver's phone leverages infrastructure from a software as you coordinate your pick up/drop off/charges information.

4.3 Classification

It was possible to identify two clusters within the ten companies analyzed, the Business to consumer(B2C) and the peer to peer (P2P) type of platform. The Business to consumer cluster is made by start-ups and initiatives put in place but big players in ecommerce. The P2P is made only by start-ups. These new firms are platforms that

meet demand and offer for shipping especially in long distances, usually all the aspects of transaction are decided among the two peers. At the research time the bigger cluster was the business to consumer, but looking and the dynamicity with which this industry is evolving the environment could change fast.

4.3.1 Business to Consumer

The industry in which those companies operate most is retail, However, many of the Crowdsourcing logistics platforms are not industry specific. They serve different kind of retailers. In most of the cases regular people deliver the items, some companies offer professionals drivers like Trunks uses both professional and regular people as delivery persons. and one uses his consumers as logistics vectors. Coreorient for instance would use in-store customers to deliver packages that its online customers have ordered thus making a little extra money.

The B2C segment is made by five companies, those firms are mostly start-ups born earliest in the year 2011 but there are even traditional companies like amazon and bringr that try to incorporate the crowd in the last mile delivery. The origin of the delivery can be the Point of Sale or a Distribution Centre. The start-ups that deliver directly from the shop of the vendor can be seen as ecommerce facilitator for those companies. Crowdsourcing possibilities allows those companies to enlarge their potential customer base. As an example, Zalando, a German e-commerce company, relies on Trunkrs to offer same-day-delivery for its customers in certain cities in Europe. Looking at the destination and the time frame of deliveries in almost all the cases the shipment is made in an urban environment and deliveries are made relatively faster than in traditional delivery. Most of the companies deliver in a matter of hours, or at least during the same working day.

The business to consumer process begins when a customer purchases something on the vendor's website, when the seller receives the order he can decide to ship it through a crowdsourcing logistics platform, to which he sends a shipment request.

Some of the vendors have a crowdsourcing as a delivery option on the website that the consumer selects if that is his/her preferred method of delivery. After that, on the crowdsourcing platform an open call to all its member is posted, all the potential delivery persons Receive the item shipment request. Among all the available workers, the first one to accept secures the job. The approved delivery person goes to the the local warehouse or the vendor's point of sale to collect the item. He/she then delivers the package to the final consumer.

Under those circumstances, the money flows in reverse starting from the final consumer to the delivery person. In all the cases the customer pays for the product and delivery. The platform takes delivery amount from the vendor and finally the delivery gets a percentage. The business to consumer model in crowdsourcing logistics is illustrated below. The stakeholders involved in the process are four

namely the customer, the vendor, the crowdsourcing logistics platform and the

delivery person as shown on horizontal lanes. The synergy between them are represented by the arrows, the oval shapes for the information flow, the red diamond shaped for the logistic flow and the rectangular ones for the money flow.
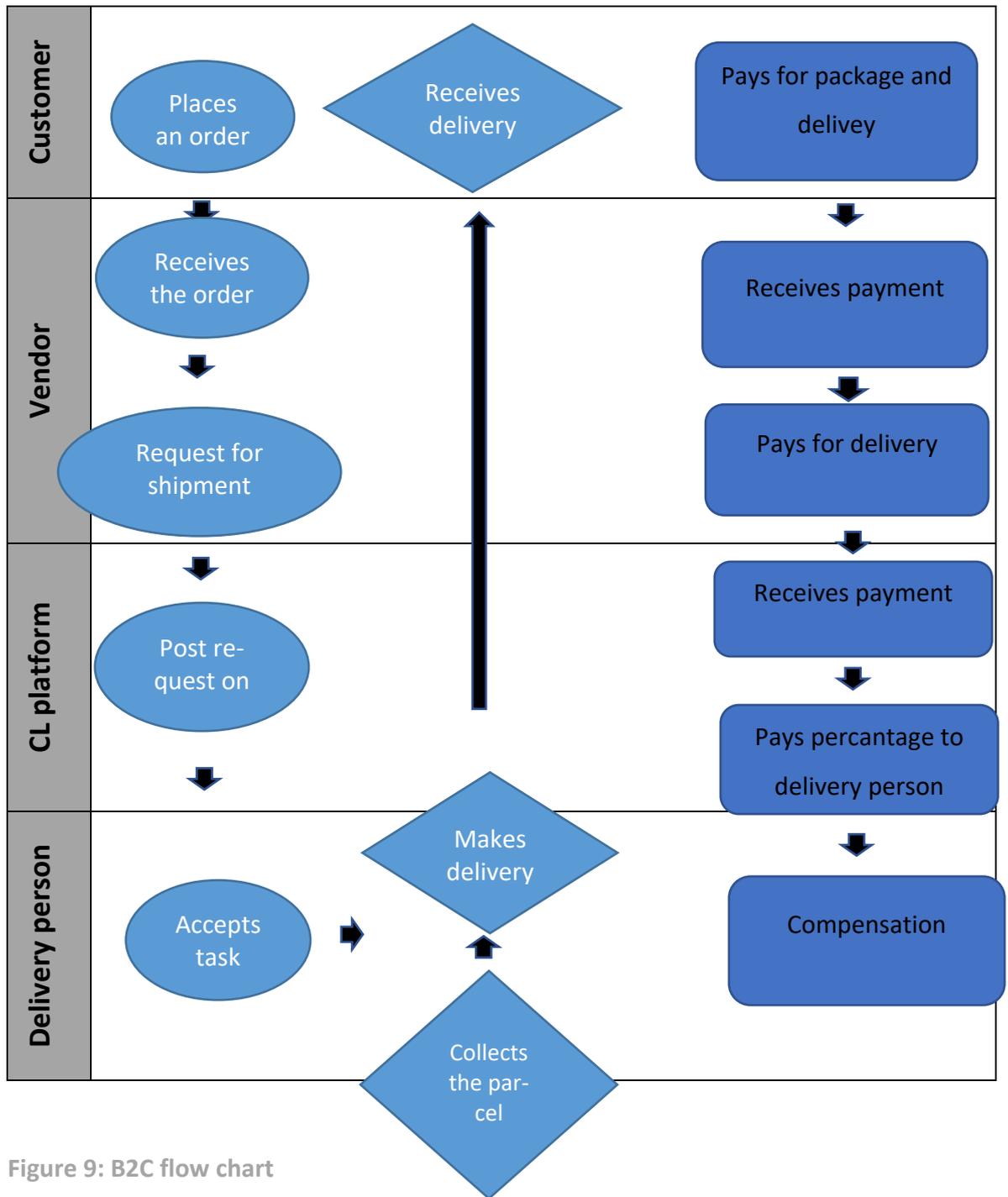
Figure 9: B2C flow chart

4.3.2   Peer to peer

The P2P side are all start-ups. In this case the company is a mediator between two individuals, the person who need to send something and the transporter. The origin point is the sender's place, could be his/her house or another location agreed between the two actors. The shipment final destination can be within an urban area, at a national or even international scale according to the different firms. The delivery time frame can be agreed between the two parties in the majority of cases. It must be remembered that all these companies guarantee the same day delivery as it states on their respective websites.

Another key point, there is no industry distinction for those companies. They are all generic that is, none of them is specific for a certain business. The crowd of carriers is made by everyone, potentially any person can deliver by enrolling on these platforms. Some companies are addressed specifically to travelers who decide to publish their itinerary and accept possible shipping requests. Such as Sennder offers same-day parcel delivery by using extra space in the luggage compartments of long-haul buses. In most of the cases the transportation fee is agreed between the two peers. In some cases other the firm gives a price based on the characteristics of the item.

The P2P business model in the crowdsourcing logistics is described in the process diagram below. The actors involved are four namely the sender, the crowdsourcing logistics platform, the delivery person and the receiver. The stakeholders involved in the process are four namely the customer, the vendor, the crowdsourcing logistics platform and the delivery person as shown on horizontal lanes. The synergy between them are represented by the arrows, the oval shapes for the information flow, the red diamond shaped for the logistic flow and the rectangular ones for the money flow.
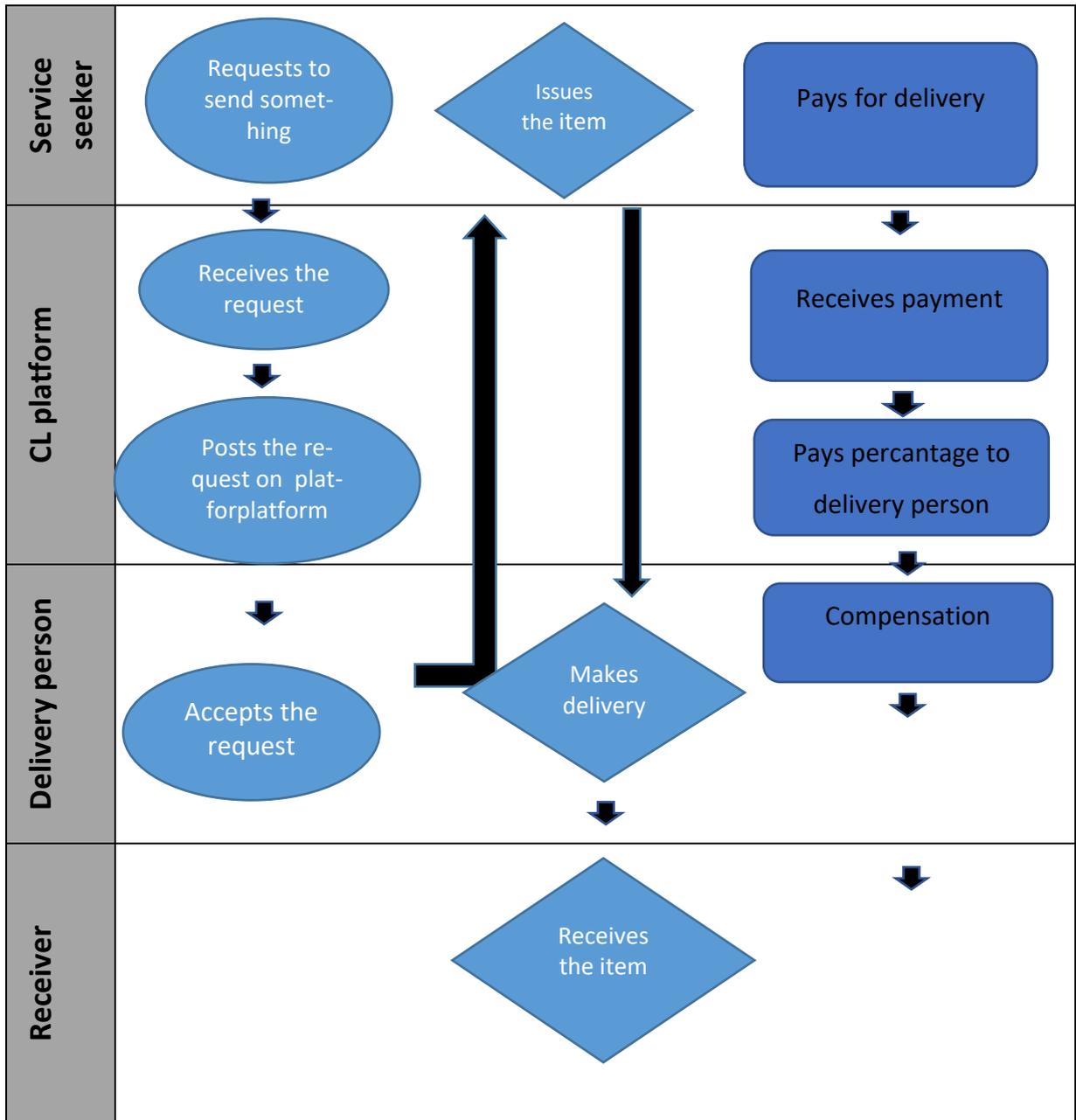
Figure 10: P2P flow chart

4.4   Crowd logistics sustainability implications

Regarding sustainability, the economic and environmental advantages are most discussed.

4.4.1   Economic sustainability

A sustainable business model depends on well-designed revenue and cost structures (Savelsbergh, 2016) Thanks to the asset-light infrastructure and operational flexibilities of CL, many authors agree that there is a minimization of costs (Botsman 2014, Shen 2016). This implies that, as opposed to traditional system, no vehicle fleet or employed drivers are required. Nevertheless, an appropriate revenue model needs to take account of the additional costs, such as insurance, software development, training, routing instructions, GPS devices and packets for shipments Designing an effective cost model is a major challenge.

Lower prices are another selling point. Multiple sources agree that the most expensive and time-consuming part of the delivery process, which is when a package reaches the customer's address. According to Paloheimo, 2016 In EU and in Finland it costs approximately 15 euros to deliver a product to a customer. At the same time customers are on average only willing to pay 5 euros for the delivery. This means that businesses lose 10 euros on average per every packet delivered to consumers. Paloheimo claims that a far more effective approach is using this kind of network of services and crowdsourced transportation as viable alternative for lowering cost compared to today's centralized mass manufacturing and transportation (Ovaska, 2016 pg 33).

In a study of a library case in Finland, the work of Paloheimo shows that the crowd sourcing of library book deliveries in the city of Jyväskylä in Finland which used an online platform called Piggy Baggy to get local people to transport books mainly by bicycle for a fair fee of 2-5 Euros. This was the first time it was tested with the public sector in Finland. (Paloheimo, 2016)

4.4.2   Social sustainability

Secondly, Crowdsourced delivery contributes to creating wealth. It allows already-on-the-road commuters or travelers to generate opportunistic complementary revenues that help cover the costs of the journey. As well, it offers an opportunity for people who want to dedicate themselves to delivery, to create their own flexible job. The customized working schedule is a key benefit. One only work during times that that fit your own lifestyle. Coreorient received funding from the European Social Fund to find ways to activate youngsters that are in danger of becoming marginalized. The company is in a collaboration with the city of Tampere making efforts to find ways to use crowdsourcing as a medium for involving young people in society and to help them find jobs. (Ovaska, 2016)

Finally, the social impact of the crowd's modal choice concerns the health benefits that result from CL concepts that stimulate soft transportation modes, such as biking and walking. In his Finnish pilot project, several crowd workers that used their bikes, declared to participate in the pilot for the sake of exercise. Paloheimo has drawn attention to the fact that Coreorient wants to take part in developing business models and win-win-win structures that maximize value for both consumers, the company itself, and the society at large. (ibid)

4.4.3   Environmental sustainability

Theoretically, crowdsourced delivery is supposed to minimize the environmental footprint and the traffic jam in cities. The number of cars is supposed to be reduced because the crowdsourcing principle is based on the utilization of "drivers already on route. Additionally, because the companies promote alternative transportation methods like bicycles or public transportation systems. However, In the CL concept,

parcels are processed individually, which might limit the overall positive sustainability impact (Rougès, 2014). Despite the fast-growing number of companies offering crowdsourced delivery, literature addressing aspects and issues related to this is still limited.Research by (Paloheimo, 2016) suggests that there is potential carbon footprint reduction.

4.5   New business opportunity

Crowdsourced delivery provides access to products that were not accessible previously. Brick-and-mortar retailers can better compete with online retailers, and widen their markets. For instance, When the seller retailer or restaurant is not selling online or has no delivery service, When an Item is not locally available or probably simply because of expensive shipping costs. Crowdsourcing provides the opportunity to post your request online and find your personal courier to buy and deliver it for you at affordable prices. Gains for retailer's Online retailers can lower the delivery costs, which are a frequent obstacle to online purchase. For example, leading mall owners have signed on with Deliv to provide same-day delivery for customers who order online or purchase in store. This offer opens the door to a disruptive business model innovation within the retail industry. Businesses can also reduce their operating costs by using crowdsourced delivery. Click-and-mortar retailers can also reduce the need to stock balance inventory amongst retail stores by using distant open distribution centers located at the periphery

4.5.1   Speed

Delivery of goods is gaining more and more importance resulting in shorter delivery cycles and complex logistic networks. Same day delivery is a new service, which is used by companies to outperform competitors. Whereas companies like Amazon are able to offer same-day-deliveries to its customers due to their size, smaller local

competitors are not. By cooperating in business to consumer crowd-based transportation platform, small and medium-sized businesses and in particular small local shops can compensate this inequality. Retailers are looking for ways to deliver goods faster to consumers' doorsteps to meet customer expectations. Crowdsourcing can drastically speed up deliveries in urban areas. The power of crowdsourcing lies in the possibility to create a huge pool of carriers. The chances to have one available carrier within a short time is very high.

For instance, As Deliv states with its slogan "Delivery Shortened", speed of delivery is a key selling point for these companies. In comparison to the traditional hub and spoke model processes of traditional companies in the parcel logistics industry like Posti or DHL, propose only one delivery tour per day. In the crowdsourced network delivery model, the intra-urban or interurban delivery is immediate if a carrier is available. The most promising start-ups for example Deliv, Trunkrs are already making deliveries within hours.

4.5.2   Personalization.

In crowdsourced delivery, each parcel is managed individually. A high level of personalization is made possible regarding time schedules, management of unexpected situations. In most companies, carrier and customer can contact one another in order to adjust the delivery process. For example, they can agree on giving the parcel to the neighbor, or on rescheduling, especially when a customer needs to leave in a hurry. For the City of Helsinki, CoReorient Ltd created the Finland's first "smart" containers where 24/7 Drop-off and delivery can take place at distributed among the city's public spaces enabling the customer to collect at own convenience. In crowdsourced delivery, convenience is the key factor.

Picture 3: Piggy baggy smart container in Helsinki

Source: http://smartnclean.helsinkibusinesshub.fi/projects/piggy-baggy-local-community-spaces

4.6   Challenges of crowdsourced delivery

4.6.1   Liability and Insurance:

Crowdsourcing logistics can be faced with risks and liability. For the recipient and service providers, highest risks are theft, loss, or damage. For the transporter goods could potentially cause physical harm since there is very little regulation of what and what not to carry. Since the platforms do not own the assets, there is little incentive initially for the platform providers to insure goods or services. Today, users and service providers must typically insure themselves, asking their insurer to find the best individual solution. This creates a significant entry barrier for new participants. To overcome this barrier, some crowd logistics platforms go people and sennder insurance policies. In the case of go people, they have partnered with a third-party insurance company fright safe. Other big players in the sharing economy industry such as

Uber and Airbnb, have developed their own custom insurance policies, providing insurance cover of up to $1 million per incident. Perhaps these leading industry's best practiced can be benchmarked especially among newer players in the market.

4.6.2 Trust and transparency

In crowdsourced delivery, a service seeker entrusts his parcels to an 'unknown' individual, more than to a company with professional employees like Posti, DHL or UPS. When introducing new services to consumers trust and reliability are crucial in order to achieve sufficient penetration. To put this in another way, users are not willing to recommend new services to others unless they trust it. Start-ups have explored different ways to reinforce trust between requesters and couriers. These risks cannot be prevented completely however, approaches to minimize it are for sure possible and range from regulative measures like the mandatory record of an ID card to crowd-based mechanisms like ratings. The most business-oriented companies have implemented thorough selection processes for couriers. As an example, at Deliv an aspirant has to fill a questionnaire, complete in person or Skype interview, submit a copy of his license and vehicle registration, complete a secure background check, and finally complete a short orientation program.

Most of companies have implemented verification of user profiles and online reviews in order to evaluate couriers in the form of a star rating and comments. Based on the track record of every courier, a ratings system enables Deliv to give priority to the highest-ranked delivery people (Lawler, 2013). Some companies like piggy baggy have personal pages or spaces on the companies' websites. This permits requesters to investigate if needed. For delivery goods with high value, an insurance and money return policy could also be introduced.

In addition, Companies are encouraging direct contacts between requesters and couriers through telephone and email. Some have gone to an extent of implementing own secure messaging system.

4.6.3   Workforce Protection

Perhaps the most sensitive and debated issue with the crowd sourcing logistics today. Most workers are hired as independent contractors and therefore do not receive benefits such as sick days or retirement plans. It has been highlighted above that these platforms can provide a good match of job opportunities, they allow flexible working schedules. Dagnino correctly argues that in forms of work where reputation and ratings play a major role in securing continuation of work with a particular platform or app and access to better-paid jobs, workers may feel particularly reluctant to exercise any collective right as it could adversely impact on their reputation (Dagnino, 2015) To date, there has been little collaboration between crowd logistics platforms to form trade unions that could influence workers' rights and government regulation.

4.6.4   Creating a pool of carriers

The power of crowdsourced delivery is based on the network effect. A critical mass of couriers is needed to ensure fast, flexible and cheaper delivery. Equally important a critical mass of customers is needed to attract couriers. That is to say, it requires lots of carriers to guarantee a fast service and lots of customers to feed the carriers.

Not only startups are experiencing this problem but also the major actors are having trouble. As an illustration USPS suspended one pilot same-day delivery program called Metro Post due to a lack of participation from retailers. Start-ups in the crowdsourced delivery industry are adopting different strategies to create the network effect. Most of the crowdsourcing startups mentioned above at the moment focus on fairly big cities to gain access to a large volume of potential customers and couriers.

4.7   What motivates the crowds to achieve network effects?

Three types of couriers were observed one, First, commuters or travelers who decide to take care of a delivery task to reduce their costs or make their journey profitable. Secondly, non-professional dedicated couriers that is, those who are mobilized in interurban or international delivery. Individuals who decide to accept some tasks. They can self-determine their schedule. For some of them, it is a part-time job to complement their other jobs. In fact, for some crowd sourced delivery has become their main source of revenues. Finally, professional couriers too who find complementary revenues in partnering with crowdsourced delivery companies.

In this business model, the company needs to benefit from the crowd by the same token, the crowd must benefit from the company. If a crowdsourcing business fails at engaging the crowds, the advantages of crowdsourcing will not materialize. Crowdsources may engage their crowds both with monetary rewards and rewards that address crowds' intrinsic motivation. In the present day social responsibility is really important thus the rewards have to be designed in a way that they do not attract only the crowds but also all the parties involved.

Willingness to participate in a study investigating the motivations why people participate in sharing economy activities, Hamari (2016) highlights that while sustainability aspects influence how collaborative consumption is perceived, participants are mostly motivated by economic benefits that is, monetary compensation. Nevertheless, other factors such as enjoyment and exercise in performing the activity and social awareness are also important. This is in accordance with the results reported in Paloheimo (2016) for the case study of a crowd-delivery pilot for a library, where monetary compensation, while important, was not the main driver for participation.

An important characteristic of crowd logistics services is that they are offered by independent providers on a voluntary basis to clarify, there is no employee-employer agreement between the company and the crowd. Relying for all or part of your logistics activities on the 'strangers' is thus a strategical/tactical decision that has major

implications. In the context of crowd delivery, professional drivers are more expensive, but are available when required and do what you need, thus providing certainty and reliability. Independent drivers are less expensive, but are only available when it is convenient for them and perform tasks that they deem beneficial, leading to uncertainty and, potentially, a significant loss of service quality. scheme utilized for the independent providers (crowd).

Regardless of whether the crowd is driven by non-monetary motivations or by the possible economic gains that can be achieved, an efficient compensation scheme is crucial for attracting participants. These can include both monetary and non-monetary incentives. On the platform side, relying on independent providers to fulfill real-time requests is challenging since the providers decide whether and when to work and this decision is driven by the offered compensation. Few providers imply that customers will have to wait more to be serviced which, in turn, will decrease customer satisfaction and demand. The platform must choose an appropriate compensation level for providers. This is a relatively new sector thus no one understands it completely. Perhaps More research is required to better understand how to make these compensation schemes.

According to Kafle (2017), other pricing mechanisms, such as the bidding system proposed in could be leveraged to address such issues. In a crowd-delivery context, bidding mechanisms could allow for a better assessment for which compensation is considered appropriate for a crowd agent and, also, help the crowd logistic platform in deciding which activities to crowdsource. He continues to argue that bidding mechanisms stimulate the use of existing flows or space instead of generating new traffic and/or capacity. That is to say, an independent driver already heading to a certain delivery location has lower marginal cost and effort and thus can ask for a smaller compensation than someone who especially has to drive there.

5 Discussion

5.1 Summary of key findings

This multiple-case study aimed at answering the four research questions by exploring strategies used in ten crowd logistics companies especially in the last mile delivery.

1. ***Can the successful technology and business model in passenger mobility and hospitality industries be applied in delivery of goods?***

The Sharing Economy has proved highly disruptive to several industries that are asset-heavy in nature, such as mobility and hospitality. But the technologies and business models enabling the Sharing Economy can be applied to any industry (DHL trend 2017). Crowdsourcing has been used for many purposes including idea generation (Leimeister, 2013) problem solving (Howe, 2006), value capture (Afuah and Tucci, 2013), information gathering (Bozzon, 2012) and consumer engagement (Brabham, 2010; Zheng and Hou, 2011) That said, logistics with all its heavy assets and infrastructure) is no exception.

In the last couple of years, crowd logistics has been bursting. Numerous start-ups have been launched and some have attracted millions in investment. Beyond that, major players are experimenting this new delivry service. Amazon, DHL, UPS, just to name but a few. They aim to create disruptive business models, based on their asset light structure and the power of the crowd. Logistics providers are optimistic about Crowd logistics as an answer to the growing expectations of customers for faster, more personalized and cost efficient delivery service. (Barclays, 2014)

2. What are the technologies enabling crowd logistics?

Logistics companies are becoming more difficult to differentiate from technology providers, they continue to leverage IT platforms as major service-selling points. This combination of technology and service provision Technology is becoming cheaper and more accessible and will in future all be mobile phone based. There are many exciting new technologies that will continue to transform crowd logistics, here are five of them of them. (*See section 4.2*)

- Mobile Devices
- Digital Payment Infrastructure
- Location Services
- Verified User Profiles and Online Reviews
- Communication application programming interfaces and Platform-specific Algorithms

3. How does crowd logistics impact last-mile efficiency? Is it possible to reduce delivery times, cost and environmental pollution?

In the supply chain, last mile logistics is the least efficient stage and causes up to 28% of the total delivery cost (Wang, 2016). Recently, crowd logistics has been introduced, mostly in urban logistics and mainly thanks to the development of ICT e.g matching algorithms, track-and-trace and routing software. The main addressed subjects are the ones regarding economic impacts and delivery times. The findings indicate that there are clear economic benefits of using Through ICT development of new mobility systems. The main motivation for a company to apply a crowd logistics strategy lies in the potential of a direct economic advantage (Mladenow, 2015). The positive economic and delivery times impact is demonstrated through simulations and analytical models, showing as for same day delivery or real time (on demand) delivery crowdsourcing can lead to a lower cost for the shipping company and then a lower price face by final consumer (Suh, 2012; Chen, 2014).

Another primary subject is the environmental sustainability of crowd logistics. The main result of applying crowd logistics is in an effort to reduce the overall number of vehicles in the cities' streets and by exploitation of the idle spaces in people cars, those leading to a reduction in travel distances and consequently in lower carbon emissions. Crowd logistics also promotes cycling, use of scooters, delivering by foot etc all which are environment friendly compared to delivery trucks. A number of studied evaluate the reduced amount of CO_2 emission. In one case the decrease in carbon emission is estimated at 94% for deliveries in an urban environment and 82% in a suburban one (Suh, 2012). In the library case study developed by (Paloheimo, 2015) the trail results in a saving 149 km and a consequent reduction of material footprint of 55 per cent and air consumption of 60 per cent (Paloheimo, 2015).

4. *Why would people be motivated to take part in crowd logistics?*

Willingness to participate in a study investigating the motivations why people participate in sharing economy activities, Hamari (2016) highlights that while sustainability aspects influence how collaborative consumption is perceived, participants are mostly motivated by economic benefits that is, monetary compensation. Nevertheless, other factors such as enjoyment and exercise in performing the activity and social awareness are also important. This is in accordance with the results reported in Paloheimo (2016) for the case study of a crowd-delivery pilot for a library, where monetary compensation, while important, was not the main driver for participation.

5.2 Crowd logistics in a nutshell

Crowdsourced delivery attempts to achieve a win-win-win situation by connecting retailers/private people with part-time individuals who have spare capacity. For these retailers/private people, crowdsourced delivery can help them reduce logistics costs, especially for last-mile delivery. It also helps satisfy the growing demand for e-commerce logistics such as speed and personalization. Moreover, it is an asset light

investment, in other words, no vehicles to maintain, warehouses to stock the products, no fixed salary and benefits to pay. Consequently, companies can achieve a lot of savings. In addition, part-time couriers can work anytime and anywhere, adding flexibility to the delivery process. From an environmental perspective, crowdsourced delivery may help alleviate the traffic congestion problem and reduce car emissions. From a social perspective, it provides employment opportunities for people who want have trouble getting a full-time job, or want to earn extra money.

As a matter of fact, crowd logistics has some obstacles and uncertainties too. This service in some instances may not yet be as reliable as those provided by traditional courier companies. A number of concerns need to be addressed such as Theft, loss, damage of parcels or late delivery may result, and it is not clear that who should be liable. These may lead to additional costs such as insurance, lawsuits and training of part-time staff. Training costs of couriers are high as their turnover rate is very high. Finally, Perhaps the most sensitive issue currently is privacy. For instance, users share personal details, ranging from names, phone numbers, emails, home addresses and shopping habits with 'strangers' which may turn out to be dangerous.

5.3   Study implications

Findings from the analysis respond to the study's research questions and help to achieve the objectives which are to critically explore new opportunities in crowd logistics for future supply chains and to understand the benefits of crowdsourced delivery for the stakeholders in the industry. To determine the extent to which crowd logistics elements fail to meet, meet, and/or exceed traditional delivery standards. These findings have several significant implications for potential positive social change on the individual level, organizational level, and at the societal level.

At the individual level, results of this study may inform that there is currently a great demand from city dwellers for cheap, personalized, and rapid delivery services. Consequently, Individuals, travelers, drivers can take advantage of these platforms to make the best use of idle logistics resources and capabilities for additional earning

opportunities, reduction of transport. More importantly, customers can benefit from reduced prices.

At the organizational level, this study yields practical implications for the management. Managerial implications are important for organizations who are considering integrating a crowd logistics model as part of their activities and for emerging players in crowd logistics industry. The main motivation for a company to apply a crowd logistics strategy lies in the potential of a direct economic advantage (Mladenow, 2015). As mentioned above, there is currently demand for cheap, personalized, and rapid delivery services. This is just the type of service that crowd logistics delivery firms are offering. Traditional firms can use it to develop an overall strategy with regard to crowd logistics. It will get managers to consider issues such as, what crowd logistics startups are currently in this market? What opportunities and threats do they represent for us? Which crowd logistics services can I call on? Crowd logistics is both a threat and an opportunity for logistics service providers because reduce their market share if not replace them. On the other hand, crowd logistics also provides an opportunity to develop new activities. The resources on which these services are based are widely available and possessed by a wide range of people; in towns, everyone moves around all the time and can easily take a parcel with them! So, there is great potential for innovation and development in the field. For that reason, service providers can look to include crowd delivery services in their offerings. Traditional logistics companies have an advantage already because have the skills to orchestrate logistics resources. DHL, for example, has tested a service of this type in Sweden, called My Ways.

The results of this study might also have implications at the societal level. Participation in crowd logistics may contributes in reduction of CO_2 emissions, as loading space will be used more efficiently, and as a possible consequence traffic might be reduced as well. Crowd logistics is considered as convenient, simple, user-friendly and efficient which consequently improves the company's image. As a result, a new community-relationship between the customer and company is formed through a tight collaboration with the customer (Mladenow, 2015)

5.4   Evaluation of study limitations

The main limitation of the study is its data collection method. The author used public documentation, with no access to first-hand information. The crowdsourced delivery industry is very young and far from maturity and the moment very dynamic, things change very fast. Due to the novelty of the industry information about business models, strategies and vision of the industry future is limited. Additionally, the sample was limited in other ways too. The sample mainly consisted of companies that were from two to seven years old. Most of the case companies were still defining their platform design and experimenting with different models. The case companies probably had not had enough experience to create the best practices and refine their business models. However, this appears to be the case with the whole industry characterized by countless new entrants taking advantage of the latest technologies. Possible biases caused by the young age of the case companies were constrained by adding more established players like Coreorient, deliv and Pigbee that were more than five years old or received a significant amount of funding.

Another key point, this thesis relies on abductive inference where findings are derived from the collected data. To such a degree, findings drawn from qualitative data are always prone to biases caused by subjective interpretation of the author (Yin 2003). Consequently, the author must limit the number of case studies, narrow down the literature chosen for the thesis and decide when sufficient saturation is reached to his/her liking. Although the sample size was rather limited, the themes that surfaced in during the case study analysis was sufficient to draw some patterns and answer the research questions. More importantly, a case study based on ten case studies is sufficient to reach reliable enough conclusions in the limits of a bachelor's thesis. (Yin 2003)

5.5   Conclusion and future outlook.

In crowd logistics, it has been proven without a doubt that the rapid pace of technology and social change are powerful drivers of this business model. Lessons learned from the passenger mobility and the hospitality industry are excellent examples of how to take advantage of available resources in the crowd. Research by (Barclays, 2014) suggests that generally, logistics providers are optimistic about the future. Barclays found that 92% of providers believe that continued growth in online shopping will provide future opportunities for growth. However, over 50% stated that a key area they see as a threat to future growth was coping with the increased capacity requirements. Nearly 35%picture growth potential through better technology and increased international delivery, which may be strengthened by investment in further delivery options. 28.3% are concerned about increased delivery by retailers' delivery services, and 33.8% are concerned by increasingly price-sensitive consumers, which may result in online shoppers opting for cheaper, retailer-led services.
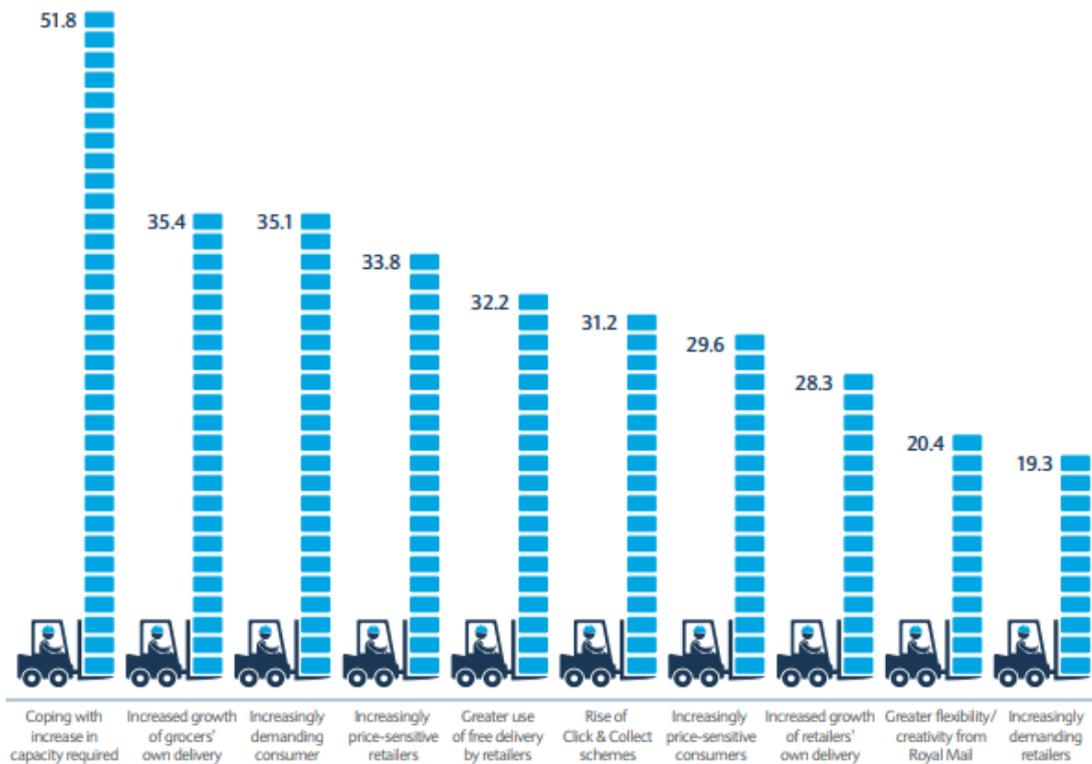
Figure 11: Percentage of logistics firms mentioning factors that they see as future threats to growth

Source: https://www.home.barclays/content/dam/barclayspublic/docs/BarclaysNews/2014/September/the-last-mile-report.pdf

Opportunities exist to increase flexibility in delivery options, along with the introduction of more premium services. (Barclays, 2014). Going forward, further acceleration of technological innovation is likely to steer crowd logistics into another dimension of efficient allocation of goods and services. Specifically, the development of autonomous vehicles, will most likely drive down transportation costs, increase safety, and shorten delivery times. For instance, Wolt is testing food deliveries by robots in partnership with a robotics company, Starship Technologies. Wolt customers can order as usual through the crowd sourced delivery platform wolt.com but they have the order delivered to their door by a small robot running on wheels instead of a person.

Picture 4: a member of staff at the Tallinn restaurant Umami, is placing a warm Wolt order of food inside the Starship robot container.

Source: https://wp-assets.wolt.com/wp-content/up-

loads/sites/3/2016/11/25170934/Wolt-Starship-01-small-1024x684.jpg

Picture 5: The Starship robot making its way to the customer.

Source: https://wp-assets.wolt.com/wp-content/up-

loads/sites/3/2016/11/25171049/Wolt-Starship-02-small-1024x684.jpg

Picture 6: Customer receiving Wolt deliveries by a robot.

Source: https://wp-assets.wolt.com/wp-content/up-loads/sites/3/2016/11/25171134/Wolt-Starship-03-small-1024x684.jpg

Wolt is currently working on how robots can man oeuvre down the street and interact with humans, how to make robotics affordable and thus everything around logistics more environmental friendly compared to using a car or scooter.

It was also highlighted in the findings that digital payments will likely continue to be a catalyst for digital innovation in the coming years and may have a significant impact in how the crowd logistics industry as a whole. The further development of blockchain, a highly secure distributed ledger technology underpinning next-generation digital currencies, could lead to removal intermediaries in the supply chain. Individuals will be able to securely broker, share, and transact their own assets without an intermediary. Consequently, this might revolutionize the digital systems of physical goods, material flows, and customer interaction with crowd logistics providers.

On the negative side, considering environmental emissions and the resultant reduction in pollution, the rebound effects of crowd logistics must be thought through. As a result of the benefits of crowd logistics such as lower costs, people may actually start ordering more, which may lead to more driving more to meet the deliveries, which consequently could neutralize the potential benefits. This shows that there are several ideas that deserve further investigation. In this respect, quantitative data analyses as well as simulations could deliver new insights. Policy issues relating to the sustainability of crowd logistics should be identified, quantified and evaluated. The government and legal regulations will play a major role in mitigating the potential risks of crowd logistics services.

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