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# Developing a Framework for the Deployment of Crowd-Shipping: A Study in the Netherlands

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## Abstract

The growth in the e-commerce platforms and online shopping has been increasing exponentially in the last decade. Businesses and logistics companies are finding new ways to ensure fast, sustainable, and safe deliveries to customers through existing means. However, to meet the ever increasing demand of deliveries, innovative shipping or delivery alternatives have been on the rise across the world. Crowd-Shipping is one such concept which aims at taking advantage of regular travellers with unused space and additional time who can pick up packages, in order to deliver packages to customers who lie along or near the same route for a small compensation. Since the Netherlands has witnessed massive e-commerce growth and demand for efficient and fast deliveries, this study aimed at how Crowd-Shipping can potentially be implemented in the Netherlands through considering a set of drivers, barriers and a business model innovation perspective. The study first investigates the existing research on the concept, focusing on the drivers, barriers and business model aspects. In order to explore these findings and potentially more or findings, we conducted the methodology which consisted of interviews and surveys. Post the interviews and surveys, a thorough analysis of the findings was conducted through content analysis, descriptive statistics and correlations. The results from the research indicate the importance of the findings from the literature with respect to existing drivers, barriers and business model perspectives while also providing insight into more drivers, barriers and business model perspectives that need to be considered for Crowd-Shipping deployment. These results are discussed in detail providing in-depth insight on the Crowd-Shipping aspects mentioned. We conclude the research by suggesting how Crowd-Shipping can be implemented in the Netherlands considering these drivers, barriers and business model aspects, following which, further research recommendations are provided.

Keywords: Crowd-Shipping, Business Model, Business Model Innovation, Mixed Methods, E-Commerce, Logistics.

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## Executive Summary

In the past decade, there has been significant growth in consumer's reliance on online shopping. This is achieved via e-commerce platforms, that have seen exponential growth due to the various advantages it offers, especially during the COVID-19 pandemic, where consumers are heavily dependent on online shopping for their daily essentials. E-commerce or online shopping growth is directly connected to the functioning of logistics companies, who are depended upon to perform delivery tasks, especially when the businesses do not have their own logistical provisions. Therefore, the growth in e-commerce directly affects and drives logistics companies to grow further in order to meet the demand.

In order to meet the demand, logistics companies need to find new methods of deliveries to ensure business and customer satisfaction and on-time deliveries. Crowd-Shipping is one such concept that has the potential to help companies meet this growth and demand, by taking advantage of regular commuters with space and time and assigning them delivery tasks along their intended route for a small compensation. The commuters can be called occasional drivers. The concept can potentially address a number of issues faced by logistics companies with respect to reducing trucks/vans, potential reduction in carbon emissions, provisions of cheaper deliveries and meet the demands of on-time deliveries. However, these implications need to be studied further in order to find out how Crowd-Shipping can actually be beneficial. Since the Netherlands is a country that also has found to have large e-commerce demand and growth, and high affinity for sustainability, the objective of the research is explore what influences Crowd-Shipping deployment in the Netherlands and therefore answer our main research question: *How can Crowd-Shipping be successfully deployed in the Netherlands?*

In order to achieve the research objective and answer the main research question, a series of sub-research questions were formulated focusing on what the drivers, barriers and business model innovation aspects are with respect to Crowd-Shipping deployment. A thorough literature review was conducted following the structure of the sub-research questions, through which key drivers, barriers and business model aspects were found. The findings from the literature review indicate that factors such as income for occasional drivers, flexibility, cheaper deliveries, eco-friendliness, expansion of operations for companies, ICT, high e-commerce demand and growth, lower costs for companies, integrating regular logistics with Crowd-Shipping, and reduction in road traffic are drivers for Crowd-Shipping deployment. Similarly, the literature review opened us up to several challenges or barriers such as trust, safety, reliability, time consumption, reverse logistics, potential local policies, wage regulations, privacy, and service quality. For the business model aspect, several existing research papers provided us insight on business model innovation, business model tools, and existing Crowd-Shipping business models. A guiding framework was then developed in order to visualise and understand what factors influence Crowd-Shipping deployment and further explore these factors and business model aspects through the research methodology.

The research methodology consisted of 5 semi-structured interviews for logistical professionals and legislative professionals, and two surveys for customers and potential occasional drivers. Post conducting the methodology and data collection, suitable methods of data analysis were chosen. For the interviews, content analysis method was used and for the surveys, SPSS software was used for descriptive statistics and correlation analysis. The findings from the results post the data analysis enabled more exploration of the existing drivers, barriers and business model aspects, as well as indicated how some of the drivers and barriers found through the literature review could be place the other way around. Drivers found through



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literature review such as lower costs, integration of regular logistics with Crowd-Shipping etc. were indicated to be potential barriers for companies while deploying Crowd-Shipping. Similarly, some of the barriers found through literature such as reverse logistics were found to be potential drivers while deploying Crowd-Shipping. Also, new drivers (environmental laws in the Netherlands, insurance, incentivising eco-friendly vehicles) and barriers (social security, traffic and parking laws, food security, illegal freight) were found. These findings were discussed thoroughly and a refined guiding framework with applicable changes was developed.

With respect to the business model innovation, two viewpoints were found and discussed: a start-up view and a business model transition view for big logistics companies. The start-up views suggest that implementing Crowd-Shipping would be suitable through providing a third party platform which enables customer, business, occasional driver matching. The platform can also integrate routing, pricing and optimisation. Providing key propositions such eco-friendly logistics, cheap delivery, insurance, flexibility and portraying as a tech company can enable start-ups make a significant impact on the logistics market in the Netherlands. For big companies, a few elements of the business models will be requiring changes, although our findings suggest that there is a first-mover disadvantage for these companies. However, if big companies do look at Crowd-Shipping deployment, their key partners (platform providers, insurance providers, occasional drivers), activities (last-mile deliveries through Crowd-Shipping, pricing, routing optimisation, matching), resources (Electric Vehicles, ICT), propositions (eco-friendly, flexibility, C2B solutions, cheap deliveries, same-day deliveries, and insurance), channels (ICT), cost structure (acquiring EVs, compensation), and revenue streams (insurance fees, subscription models) would have to transition from existing elements and factors.

Theoretically, the results of this research add to the elaborate existing research on Crowd-Shipping drivers and barriers focusing on the crowd, while also providing different angles of drivers and barriers including the logistics companies and legislative authorities. The research also bridges the gap between core Crowd-Shipping and business model innovation research, thus providing important practical insights as to how the concept can be deployed through a business or company perspective. Practically, the implications of the research mainly focus on companies, both start-up and established, and how the drivers, barriers and business model innovation aspect can be utilised to make Crowd-Shipping deployment a reality in the Netherlands. Entrepreneurs or start-ups focusing on the logistics sector can deploy the concept in a more straight forward manner in comparison with big, established logistics companies, due to the various challenges found. However, if big logistics companies do want to deploy the concept, the various drivers, barriers and business model transition views found may be helpful in this consideration.

The findings and the discussions enabled us to conclude our research by answering the main research question. Crowd-Shipping in the Netherlands can be successfully deployed through a third-party platform, which can enable matching mechanisms not only between customers, occasional drivers and businesses, but also logistics companies who need to address excess demand and forecast. The platform can provide all the necessary drivers and value propositions in order to attract stakeholders and also provide provisions to ensure safety, trust, and privacy. Since the deployment may be new in the country, policy implications may have to be addressed, which platforms especially in the shared economy do, once they make significant impacts in the market. The concept is potentially useful in viable if deployed in a specific way for specific tasks such as last-mile deliveries, which may ensure companies do not invest more than they gain from delivery services.

Limitations and recommendations for further research are provided which are in the direc-

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tion of a more holistic approach with respect to bringing in businesses' viewpoints as well as more in-depth analysis of some drivers and barriers. An interesting approach would also be in the direction of a cost-benefit analysis, which will give key figures to companies willing to deploy Crowd-Shipping.

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# 1 Introduction

Ever since the concept of Internet exploded and the .com boom came into prominence, media/platforms such as e-commerce have grown in importance. E-commerce or e-commerce platforms/media are essentially retail outlets that buy and sell goods or services through the internet. An industry that is directly linked to the buying and selling of goods and services is the logistics or the supply chain industry. The growth in e-commerce platforms and exponential sales through these platforms have resulted in an equal proportion of growth and demand for logistics (Sabanoglu, 2021).

The growth can also be attributed to the ongoing COVID-19 pandemic, where e-commerce has become the backbone of facilitating daily needs and essential goods for consumers across the world (OECD, 2020). Logistics companies have taken a step ahead to address this growth and demand, especially in terms of safety, efficiency, and innovations (Bartman, Dolan, Panikkar, & Williams, 2020). A concept that has emerged in recent times that has the potential to address this growth and demand is Crowd-Shipping.

Crowd-Shipping (CS) can be broadly defined as a concept that involves logistical companies or third-party platforms to enable a pick-up and delivery system that is performed by regular travellers or commuters on road, who can accommodate a package/service and deliver it to customers who fall along the intended route the traveller/commuter is taking (USPS, 2014). A small detour might be required for the person performing this activity, for which he/she will be compensated by the company. A term that has been coined for the concerned people is known as occasional driver (OD).

Crowd-Shipping, if fully implemented, can potentially be beneficial for logistics companies. The idea potentially allows for the reduction of delivery vehicles on the road (McKinnon, 2016) (Le, Ukkusuri, Xue, & Van Woensel, 2021). Delivery times for packages/services could be reduced if an efficient Crowd-Shipping service is implemented, due to the potential elimination of shuffling of packages between hubs, transit centres and warehouses. The concept can also prove to be cost-effective with respect to reduced expenses for wages/salaries of fully employed drivers (USPS, 2014).

## 1.1 Problem Definition:

In literature, the concept of Crowd-Shipping is not new and has been addressed to analyse several aspects. However, majority of the research conducted focuses on the determinants (drivers or barriers) of Crowd-Shipping services from the customer perspective, occasional driver perspective and several mathematical models (operations with ad-hoc drivers, etc.). Punel & Stathopoulos (2017) suggest that research with respect to the two core stakeholders (customers and occasional drivers) have been addressed elaborately, but there are several other stakeholders that are instrumental in the Crowd-Shipping deployment. Rai et al. (2017) indicates that perspectives of stakeholders such as logistics companies need to be taken into account in future research. Similarly, Le et al.

(2019) and Briffaz & Darvey (2016) suggest that the growth of Crowd-Shipping heavily depends on governmental policies and that Crowd-Shipping companies need to focus on policy implications in order to overcome any potential challenges.

Deploying Crowd-Shipping will require identifying the drivers and barriers with respect to different stakeholders, apart from the crowd. As mentioned earlier, there is lack of research concerning how Crowd-Shipping can be deployed through logistical and legislative stakeholder perspectives. This research aims to address the gap identified with respect to understanding an overall, broader perspective of how Crowd-Shipping can be deployed through the eyes of multiple stakeholders including logistics companies, the crowd and legislative bodies.

Since Crowd-Shipping can be perceived to be a new product or service, it becomes important for companies to incorporate a strategy or a plan to execute this or bring it to the market. Research regarding Crowd-Shipping business models focus more on existing Crowd-Shipping companies and how their business models are structured. However, if companies want to deploy Crowd-Shipping, it becomes important to focus on how they can adjust their business models or develop new business models, depending on their functioning and scale. Although bringing in a business model aspect to Crowd-Shipping research is not typical, focusing on this will enable us to derive a deeper understanding of how Crowd-Shipping can be deployed from a company's perspective.

To summarise the problem definition, this study aims to address the lack of research with respect to an overall perspective of Crowd-Shipping from the views of three key Crowd-Shipping stakeholders: the crowd, logistics companies and legislative authorities, and focus on what drives or challenges these three stakeholders for deploying or participating in Crowd-Shipping. In addition to this, the business model innovation aspect is added to the research to address how companies can adjust themselves if this service is incorporated into their business models. The significance of addressing this gap is twofold. Firstly, various motivations and challenges (drivers and barriers) for three key stakeholders will be addressed, which will provide a broad, overall perspective into Crowd-Shipping benefits and disadvantages. As mentioned, thus far, most research focus on the crowd. Secondly, the research could potentially give companies who are looking at Crowd-Shipping as an option, a business model innovation view, which could be useful in their implementation steps ahead or transition. This is an important contribution of the research, as business model innovation enables companies to adapt to customer/market demands and expectations (Landry, 2021).

## 1.2 Research Questions

In this thesis, our objective is to explore what influences Crowd-Shipping deployment and provide a framework that may enable the deployment of Crowd-Shipping. The research will be limited to the Netherlands, a country that champions sustainability but has not found suitable ground to enable the deployment of the Crowd-Shipping system, which in many ways is claimed to be a green and sustainable complement to regular logistical operations.

Through the gaps found in the existing literature, we arrive at our main research questions followed with the sub-research questions which will enable in answering the main research question.



The main research question is as follows:

***How can Crowd-Shipping be successfully deployed in the Netherlands?***

The main research question aims to provide a broad perspective of how Crowd-Shipping can be deployed through the views of three different stakeholders, which is something that existing research has not addressed thus far. Secondly, these views will be analysed to find out how the concept can be deployed in the Netherlands, where Crowd-Shipping has not yet been implemented despite continuous growth in e-commerce and logistical demands.

The sub research questions are as follows:

- What are the drivers that influence Crowd-Shipping deployment?
- What are the barriers and challenges faced while deploying Crowd-Shipping in the Netherlands?
- What changes would companies have to make in their business models to implement Crowd-Shipping?

For the sub-research questions, the literature review will be used to derive the existing drivers, barriers and business model innovation implications on the Crowd-Shipping concept. Along with the literature review, the findings from the methodology (content analysis from interviews), descriptive statistics and correlation analysis (from surveys for customers and potential occasional drivers) will be used to explore the findings from the literature review as well as find new drivers, barriers and business model aspects with respect to Crowd-Shipping implementation in the Netherlands. Through these findings for the sub-research questions, the main research question will be answered by the means of suggesting how Crowd-Shipping can be successfully deployed in the Netherlands after a thorough analysis of the drivers, barriers and business model aspects. The following sections of the report will contain the literature review, methodology, results, discussions and the conclusions.

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## 2 Literature Review

This chapter aims to find and review the existing research on the concepts of Crowd-Shipping and business model innovation. The literature review will enable us in developing a framework consisting of the factors that influence Crowd-Shipping deployment, which will further be used during the methodology process of the research. The literature review can be broadly divided into three sections: Crowd-Shipping (Origin and Operational Aspect), Drivers and Barriers for Crowd-Shipping, and Business Model Innovation.

### 2.1 Crowd-Shipping

To begin with the origin of the concept, Crowd-Shipping was generated first in the United States where retail conglomerate Walmart, studied the implementation of a system that involves in-store customers delivering goods to other customers who placed online orders and incidentally fell along the same route or with a small detour (Arslan, Agatz, Kroon, & Zuidwijk, 2019). Another corporation named Cargomatic introduced the idea of local shippers or couriers picking up and delivering packages to customers in case their vehicles had additional, unused space that could be utilised for this service (Boysen, Fedtke, & Schwerdfeger, 2020). DHL launched a pilot program called MyWays which paved way for residents of Stockholm to deliver goods to other residents of Stockholm through the last-mile delivery process (DHL, 2013).

To give an operational aspect focusing on the concept of Crowd-Shipping, we will review relevant literature. Dayarian & Savelsbergh (2020) developed a dynamic, stochastic vehicle routing problem, which was intended to study the time, willingness and demand of in-store customers to deliver packages. The study found that this system would be well functional if the store's current delivery system is not able to meet the delivery demands. In-store customers could come in handy if the orders are beyond forecast and therefore the use of crowd-shipping would excel in such situations (Dayarian & Savelsbergh, 2020). Compensation for the in-store customers was found to be the main motivational driver. However, deciding the amount of compensation was found to be a trade-off for stores between high compensation demand from customers and the profit margin for the stores in employing them. Similarly, a stochastic last-mile delivery model was developed using an agent-oriented optimisation problem with people who would potentially be occasional drivers by Gdowska et al. (2018). A methodology for remuneration and willingness was developed which provided a potential breakthrough in terms of a compensation model for occasional drivers (Gdowska, Viana, & Pedroso, 2018).

Another dynamic pick-up and delivery, non-stochastic problem was developed by Arslan et al. (2019), where occasional drivers utilised existing traffic flows in urban areas. However, the research assumes that all occasional drivers will receive a compensation that is similar to the wages of regular drivers, which may not be the case in reality. The results from this research indicate that cost-effectiveness (by allocating fewer resources) and eco-friendliness are potential drivers for Crowd-Shipping deployment. Archetti et al. (2016) developed a vehicle routing problem with occasional drivers by considering different aspects such as time window problems and multiple

deliveries in order to find the potential benefits and challenges of Crowd-Shipping implementation. The results indicate that a significant amount of costs savings can be realised if there is large supply of occasional drivers (Archetti, Savelsbergh, & Speranza, 2016).

The origin and operational based Crowd-Shipping literature indicate cost-reduction for companies and reducing overall mileages. Also, the results in the operational side of Crowd-Shipping literature revolve around several assumptions on time constraints, demand and other factors. To understand the drivers and barriers of Crowd-Shipping deployment in-depth, the following section will discuss more relevant literature with respect to this study.

## 2.2 Drivers and Barriers of Crowd-Shipping Deployment

In literature, several drivers and barriers of Crowd-Shipping deployment have been elaborated on. Le & Ukkusuri (2018) developed a quantitative regression model to study the willingness and travel time tolerance of occasional drivers in the United States. The first observation from the research was that people who were previously involved in freight transport or cargo and have low income were found to be more driven to participate in this system (Le & Ukkusuri, 2018).

Similarly in Italy, Marcucci et al. (2017) investigated the potential of crowd-shipping in urban areas through a survey focusing on occasional driver willingness. Data shows that the compensation awarded for the participation in Crowd-Shipping system is the main motivation for occasional drivers, which is in line with Dayarian & Savelsbergh's (2020) research. The sample size for the research consisted mainly of students in Italy of which 87% were willing to take part in this system expecting an earning between €5-10 for a single delivery. Apart from the compensation, environmental benefits were found to be the key driver and safety concerns, a barrier which influenced occasional driver participation (Marcucci, Le Pira, Carrocci, Gatta, & Pieralice, 2017). The results further suggest that several obstacles need to be looked into in terms of logistical operations, as crowd-shipping is a complementary operation to the regular logistical operations (Marcucci et al., 2017). Our research will aim to address these obstacles.

A quantitative research backed by surveys was conducted focusing on the performance metrics of crowd-shipping by Ermagun et al. (2019). The findings from this research show that urban areas have a higher demand for crowd-shipping systems than sub-urban, lower developed areas. This could be a potential driver for logistics companies. The density of couriers, demand and vehicle concentration are all factors that appear to be more consequential in urban areas than the sub-urban areas, which show too little of concentration to provide valuable insights (Ermagun, Shamshiripour, & Stathopoulos, 2019).

Through modelling the acceptability of Crowd-Shipped goods using a stated-preference survey, Punel et al. (2017) observed from their research that lower delivery costs, flexibility and environmental friendliness are the drivers of Crowd-Shipping. A logistics company can incur fewer costs as compared to costs incurred through regular operations concerning infrastructure. This is directly proportional to the delivery costs, which will reduce considerably as well as delivery time flexibility, which is a customer's main priority (Punel & Stathopoulos, 2017). Users with experi-

ence in innovative delivery methods are more critical of crowd-shipping. One way to further study this and derive solutions is to observe users' delivery experiences when the system is implemented. However, Patel (2020) suggests that concerning consumer protection, companies will have to look beyond just reviews, ratings and feedback mechanisms to ensure consumers get their money worth and to prevent hassle, regulatory authorities would have to ensure full consumer protection in the case of Crowd-Shipping.

Bellotti et al. (2015) suggested that a sense of community (for environmental reasons and helping people earn) is one of the drivers for Crowd-Shipping use. Munoz & Cohen's (2016) research also validates the eco-friendliness characteristic of Crowd-Shipping and adds that if delivery routes are optimised, fuel savings and delivery costs could be added advantages to the deployment of this system. Similar to Bellotti et al. (2015), an important conclusion from the research is that customers and occasional drivers feel a sense of community while using this system. The contribution to society in terms of the environment and potentially reducing traffic flows attracts more occasional drivers and customers to participate in this system (Cohen & Munoz, 2016).

Through a survey conducted aiming to find the difference between crowd-shipping users and non-users, Punel et al. (2018a) developed a proportional test analysis. The key insights from this research are that crowd-shipping is more certain to work under men who are young and full-time employed. Young men showing more willingness is also in line with Le & Ukkusuri (2018)'s study. Customers who do not find the service trustworthy come under the category of non-users. While comparing Crowd-Shipping to similar services, for platforms providing ride-sharing, only 7% of the people surveyed were willing to share a ride with an unknown passenger in the United States (Chaube, Kavanaugh, & Perez-Quinones, 2010). This also serves as a potential barrier to logistics companies. Highly-educated people are also less likely to involve themselves in this system as compared with low-educated people (Punel, Ermagun, & Stathopoulos, 2018a).

A research was conducted with a different methodology (state of practice and research review) by Pourrahmani & Jaller (2021), focusing on the operational challenges and research opportunities for Crowd-Shipping in last-mile deliveries. The conclusions from the research suggest how Crowd-Shipping strategies differ from company to company especially concerning operations and pricing. Pricing strategies are found to be key factors influencing Crowd-Shipping implementation (Pourrahmani & Jaller, 2021) (Lin, Chen, Zhen, Jin, & Bian, 2018) (Rasulkhani & Chow, 2019) (Özkan, 2020). In addition to pricing, environment, trust, reliability, infrastructure and market conditions are found to be the other key factors influencing Crowd-Shipping. Similarly, Rouges & Montreuil (2014) also found trust as a barrier to Crowd-Shipping along with data privacy (for customers and authorities) and service quality (package handling).

To add another perspective to what may influence Crowd-Shipping deployment, it is important to acknowledge that the flow of goods in the reverse directions may always not be the same as in the incoming direction. Reverse logistics is a growing issue concerning last-mile deliveries (Le, Stathopoulos, Van Woensel, & Ukkusuri, 2019). In China, a pilot study was conducted to analyse taxi-driver efficiency in performing the tasks for return of packages (Pan, Chen, & Zhong, 2015). According to the study, the tracing of taxi drivers as well as being an additional source of income for them are very important drivers in enabling this process.

Another research on the reverse flow of packages was conducted in a metropolitan region in China by Chen et al. (2017), where in addition to taxis, general stores were brought into the picture. The research brings about an interesting solution to avoid tracking and tracing of the occasional drivers by introducing modular containers, which can be tracked along the journey (Chen, Pan, Wang, & Zhong, 2017). In India, Upadhyay (2020) suggested that an Information and Communication Technology (ICT) platform could be developed by logistics companies that enable matching or pairing an occasional driver and a customer who wants to return a package based on the occasional driver's route. Traffic and costs are seen as potential benefits of this reverse logistics mechanism (Upadhyay, Vasantha, Tiwari, Tiwari, & Pandiya, 2020). Also, ICT enables route optimisation and space optimisation for occasional drivers (Paloheimo, Lettenmeier, & Waris, 2016). Kumar et al. (2014) indicate that ICT and e-commerce are inseparable elements. However, digital platforms could also be a barrier for users residing in areas lacking technological familiarity.

Guo et al., (2019) studied the integration of crowd-sourced deliveries into last-mile logistics to quantify its feasibility as a potential driver for logistics companies. The study focuses on why traditional delivery services are required to be integrated with crowd-sourced deliveries to exploit the full benefits of the latter. Five basic rules could be required to follow for logistics companies to smoothly integrate Crowd-Shipping into their system. These are co-functionality, small-scale pilot programs, community-backed approach, low complexity and low investment levels by companies (Guo, Jaramillo, Bloemhof-Ruwaard, & Claassen, 2019). The research also acknowledges the fact that the traditional services cannot be replaced but need to be complemented with crowd-shipping services, which is in line with Simoni et al. (2019).

In the case of Crowd-Shipping, the occasional drivers' wages would most probably depend on the number of deliveries and the distance covered to complete a delivery. Companies need to develop a wage model to ensure the compensation process is smooth (Joerss, Schröder, Neuhaus, Klink, & Mann, 2016). However, in several countries, there is a minimum wage law that companies need to adhere to. Therefore regulatory authorities will have to catch up to avoid exploitation of workers in the shared economy space, including Crowd-Shipping (Patel, 2020). Social consequences of wages need to be studied further (Gatta, Marcucci, Nigro, & Serafini, 2019). Finally, taxes are something that may not occur to most people while considering a regulatory challenge in the shared economy space. Another legal barrier in several countries could be concerning the legalities of certain items or substances being different in different provinces or states. Occasional drivers need to be sure of what parcel they are carrying or handling (Kafle, Zou, & Lin, 2017).

So far, literature mostly focusing on customers and occasional drivers are provided. However, the presence of other stakeholders need to be acknowledged, and their preferences need to be discussed (Rai, Verlinde, Merckx, & Macharis, 2017). According to Rai et al. (2017), five stakeholders are associated with Crowd-Shipping: Customers, Occasional drivers, Logistics Companies, Businesses and Platform providers. The latter can be the party that is responsible for the ICT infrastructure that enables Crowd-Shipping services. However, platform providers can be the logistics companies themselves, if they choose to provide Crowd-Shipping services. According to the research, certain environmental factors and societal factors may not have been met with

Crowd-Shipping services but the drive from the key stakeholders namely: companies, crowd and businesses can make sure the concept is implementable. Three aspects are important to ensure the eco-friendly proposition: third party involvement, willingness from the people and type of transport used. The research also points out the fact that logistics companies may not be keen on integrating Crowd-Shipping services (Rai et al., 2017). Our research will address other stakeholder perspectives as suggested by the above study.

While focusing on the drivers and barriers of Crowd-Shipping deployment, we notice that an extensive amount of research has been conducted to understand the motivations and apprehensions of two stakeholders, customers and occasional drivers. However, we notice lack of research focusing logistics companies and legislative authorities. Also, there is a lack of a business model perspective as to how Crowd-Shipping can be implemented by companies. The following section of literature addresses the aspect of business models and Crowd-Shipping related business models in brief.

## **2.3 Business Models**

In this section of the literature review, we will focus on business model innovation broadly and narrow down the focus to Crowd-Shipping business models to gain more insight on the business side of the concept.

### **2.3.1 Business Model Innovation**

In the last decade, business models have become integral to the concept of innovation and studies of innovation. Business models provide two key aspects for managers. Firstly, the business model enables a channel or a connection for entrepreneurs between the product and the market, and help in determining the outcome. Secondly, the business model may be crucial as the source of innovation itself (Chesbrough, 2010). Also, business models are a means to achieve sustainable solutions in the present world, driven by the growing trends of all sectors around us which in turn drives growing inequality (Piketty & Saez, 2014). Business models can be defined as a framework of how a company or firm can create, deliver and capture value through their products or services.

Literature for business models are not new having backed by several years of studies focusing on different approaches and models. An integrated approach or understanding of business model management can be classified into three approaches: Technological, Organisational and Strategic. These approaches speak for themselves, each focusing on technological aspects, organisational structures and strategies which enable entrepreneurial activities. However, there is no standardised or consistent approach to analyse or develop business models in research so far (Pateli & Giaglis, 2004). There is a difference between business model understanding between traditional businesses and digital businesses (Wirtz, 2011). Since Crowd-Shipping focuses on the digital business side due to globalisation, high intensity of competition and most importantly networking and market driven by demand, the digital business model perspective fits better for this research.

Business model innovation can be defined as a combination of two subsets, one being the

original business model design and the other being how the existing business model can be re-designed/reconfigured. At the time of the internet boom in the 90s, the requirement for new revenue streams as well as innovative concepts became the heart of developing business models (Zott, Amit, & Massa, 2011). However, not all redesigning may lead to business model innovation. The business model innovation may also be deeper than just the two subsets mentioned. Existing research emphasises on two aspects regarding business model innovation. The first aspect is how it is not possible for companies to modify business models without being clear on the exact value proposition that is being created for customers (Bajaj & Johnson, n.d.). Companies tend to get stuck or progress slower than expected due to the inability of finding a market. Therefore, a clear value proposition that is unique needs to be charted out. The second aspect is how the operating model requires a change along with the new value proposition, involving a multi-disciplinary orchestration of activities (Lindgardt, Reeves, Stalk, & Deimler, 2009). However, this is also challenging for companies to implement. Both these aspects are important for the research due to the presence of the possibility of implementing Crowd-Shipping from a big company perspective and a start-up perspective.

The literature on business model innovation is elaborate and we have found that traditional business models differ from digital business models. The literature also indicates how unique value propositions enable start-ups gain a head-start and existing companies need to have both a unique value proposition as well as change their operating models. The following section of the literature will focus on how these two aspects can be elaborated on in a structured manner using one of the several business model tools.

### **2.3.2 Business Model Tools**

Names and categories of business model tools are nascent in literature. However, there are a few websites such as BMToolBox.net that provide clear distinctions between business model tools (Athanasopoulou & De Reuver, 2020). For this research, 9 business model tools are reviewed namely: Minimum Viable Product, Value Network, Social Business Model Canvas, Business Model Framework, Business Model Canvas, Lean Canvas, Interview, Empathy Map, and Customer Exploration Map. Amongst these, the business model canvas tool is most suitable for this research due to several advantages it offers. The business model canvas is a tool that helps in simplifying and understand the business model of an organisation (Hong & Fauvel, 2013). The business model canvas provides advantages such as simple, quick and clear demonstration of a company's business model, less time consumed for developing, holistic view and good basis for showing a business idea. Although the level of information displayed through the canvas can be minimum, the canvas does enable readers or viewers to intuitively understand the message conveyed (Becker, 2021). Also, there is adequate emphasis on key elements that businesses need to showcase especially value propositions (Athanasopoulou & De Reuver, 2020).

There are various elements of a business model canvas that enables viewers to visualise how a company functions and what companies aim for in terms of value propositions, customer segments, revenue model, expenses and so on. The business model canvas is shown in Figure 1. There are 9

elements in a standard business model canvas namely (BMI, 2021):

1. Customer Segments: The customer segments display who are the main customers the company targets for their products or service.
2. Value Proposition: Value proposition is a very broad concept which could be defined as what values do the company aim to generate by selling their products or services. Value propositions can also signify a company's competence and differentiating factors.
3. Revenue Streams: This part of the business model canvas will display a list of all the sources of revenue for the organisation.
4. Channels: Channels is the part of the business model canvas which will display how companies communicate with their customer as well as through what medium they deliver their value propositions.
5. Customer Relationships: How companies maintain relationships with their customers will be displayed here.
6. Key Activities: The key activities are the actions that the company performs every day to stay course on the business model.
7. Key Resources: The resources required to run a company will be listed in this part of the business model canvas. Resources included can be money, knowledge, human resources and so on.
8. Key Partners: The most important partners of the company to enable the functioning. This list can include stakeholders and other parties that the company cannot run without and cannot execute its business model.
9. Cost Structure: The investments and costs incurred by companies to execute a business model will be included in the cost structure.

The elements of the business model canvas mentioned above will be utilised to elaborate on our findings with respect to business model innovation for Crowd-Shipping. Also, the aspect of business model innovation for big logistical companies will be explained through a dynamic business model canvas, which was studied by Khodaei & Ortt (2019). However, it is also important to focus on existing Crowd-Shipping business models and business models of leading logistics companies in the Netherlands. The following section of the literature review will focus on existing business models and research recommended for Crowd-Shipping business models.

### **2.3.3 Business Models of Logistics Companies**

Logistics Companies have broad business models due to the number of services they sell. Due to this, the business model of these companies will be elaborated based on their e-commerce and package delivery services.



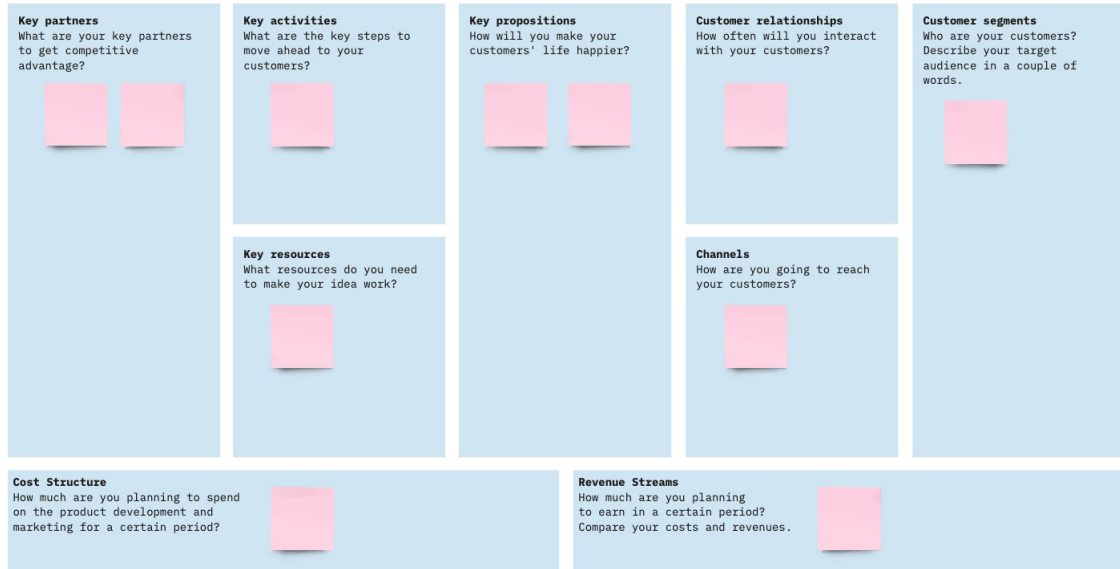


Figure 1: Business Model Canvas (Osterwalder, 2005)

1. DHL: With respect to package deliveries, DHL focuses on providing transportation, sorting and delivery of goods. Their customer segments include business customers and private customers and they deliver promise through their motto of "Excellence. Simply Delivered" (DHL, 2018). DHL provides value through sophisticated, tech driven solutions along the entire value chain of the customers and designs appropriate solutions for their service portfolio. Their e-commerce solutions focus on B2C and B2B marketing and they currently have the highest market share in this segment across many countries in Europe. The company is also striving to go green in the future and have already taken steps to combat climate change such as acquiring more electric vehicles and promoting green supply chains (DHL, 2018).
2. UPS: UPS like DHL have several services and products in operation. UPS is the largest logistics company in the world and also have a thriving e-commerce business. Unlike DHL, UPS build their customer relationships through reputation and partnerships, also providing subscription like services for regular customers and businesses. Also, UPS prioritise optimisation of routes through which the build their delivery mechanisms on. The company analyses road traffic rules in every country they operate in order to take advantage of and sell this proposition to customers. Their operations range from B2B and B2C for e-commerce while gaining revenue through fast delivery, subscription fees, sales of spare capacities in vehicles and value added services (UPS, 2018).
3. PostNL: PostNL is a logistics company that primarily has operations in the Netherlands unlike DHL and UPS who have operations worldwide. Their three core activities include collecting, sorting and delivering. The company has expanded operations to the Benelux region on a large scale, making them a highly profitable and credible company. The company's business model also focuses on being tech driven, utilising state of the art information technology and platforms to enable smooth functioning and customer relationships. PostNL creates value based on four pillars: Customers, Social, Environmental and Financial and

provide a high social security factor for their employees through which their social value is driven. They also rely on the growing e-commerce demands to help improve their already existing efficiency further (PostNL, 2019).

#### 2.3.4 Crowd-Shipping Business Models

In a first, Rouges & Montreuil (2014) studied several start-ups to study the business models which could reinvent the conventional delivery systems through Crowd-Shipping. A tetrahedral business model framework was used in the research to visualise the Crowd-Shipping start-ups. According to the study, the B2C (Business to Consumer) and P2P (Peer to Peer) offers are the key components of start-ups' offer pole. These companies aim to creation pole consists of how the businesses operate and in this case, the start-ups use web or app-based interfaces, matching systems, payment portals and live tracking for the creation. However, the interfaces are different and some companies may have low-tech processes as well. The revenue streams revolve around negotiations, fixed prices, memberships and resale margins (Rougès & Montreuil, 2014). The stakeholders elaborated on are the couriers or occasional drivers and finally, the study indicates key values for the companies investigated, which are efficiency, human touch, trust and control. These are key takeaways from Rouges' research which will be utilised for the thesis.

Frehe, Mehmman, & Teuteberg's (2017) focus on understanding the crowd logistics business models and provide valuable insights on the nature of current crowd-shipping business models. The research suggests 4 important sub-models that can work efficiently for the deployment of crowd-shipping. The first sub-model suggests that companies should have a concrete strategy to implement crowd-shipping (Frehe, Mehmman, & Teuteberg, 2017). Companies need to act as mediators only, in order to provide an efficient service to the customer and an occasional driver. The customer and occasional driver can come to an agreement about the participating fees. The second sub-model is to provide a seamless ICT infrastructure that would ensure smooth communication and information exchange between the company, customer and the occasional driver. This is a crucial point for enhancing the crowd-shipping operations. The third sub-model that is suggested is with respect to networking, customers and markets.

Currently crowd-shipping services focus on B2C or even C2C (Consumer to Consumer). Even existing research ((Gatta et al., 2019) (Marcucci et al., 2017) (Lin, Nishiki, & Tavasszy, 2020)) focus mostly on B2C type of Crowd-Shipping services. This restriction can be opened up and companies which have B2B operations can also help expanding the potential of crowd-shipping operations. A large number of companies, customers and potential occasional drivers need to be determined for an extensive and profitable use of this system and therefore it is important to conduct further research into the willingness of these three stakeholders. The fourth sub-model elaborates on the financial aspects whereas the fifth sub-model talks about the organisation and development (Frehe et al., 2017). With regard to the fifth sub-model, the paper concludes that the concept of crowd-shipping can be adopted by a large company or a start-up in a city or town, but for expansion, there are political obstacles that need to be overcome. Currently, the planning tools available to logistics companies cannot capture the dynamics of crowd-shipping without breaking

a few rules and regulations (Frehe et al., 2017).

## 2.4 Literature Takeaways

The literature review conducted calls for important aspects to be addressed. Although there is extensive research available focusing on the crowd (occasional drivers and customers) and their motivations or apprehensions, there is lack of research addressing the other stakeholder motivations and views, like logistics companies and regulatory authorities. Also, there is very limited understanding on the business aspect of Crowd-Shipping deployment i.e. the business model perspective and what companies may need to consider while incorporating Crowd-Shipping. The European Commission (2016) suggested that a comprehensive assessment needs to be undertaken of the critical elements such as economic, social, legal and psychological issues that might affect the success of crowd-shipping.

This research aims to provide an overall assessment of how Crowd-Shipping can be deployed taking into account the drivers and barriers for three key stakeholders involved (the crowd, logistics companies and legislative authorities). The research will also bridge the gap between the Crowd-Shipping concept and the business model innovation aspect, which is crucial if companies want to develop/implement a product or service. Developing a framework that will explore the drivers, barriers and business model innovation, for the deployment of crowd-shipping would be a novel addition to the existing literature of this concept. Since the data collected will be from the Netherlands, the research will be focused on delivering a framework for the deployment of Crowd-Shipping in the Netherlands.

## 2.5 Guiding Framework

Through the literature review, a Guiding Framework has been developed in order to help answering the sub research questions through which the main research question will be answered. The Guiding Framework will enable us to understand the concepts studied thus far and also to be utilised for the exploratory study that will be conducted, through which we hope to find more drivers, barriers and business model perspectives. The literature review has allowed us to derive a set of influencing drivers and barriers with respect to Crowd-Shipping, and business model perspectives on Crowd-Shipping.

There are a set of different drivers that influence different stakeholders in the process of implementing Crowd-Shipping. For the Crowd which consists of occasional drivers and customers, the drivers that influence their willingness to participate are income, delivery charges, contributing to the environment, flexibility, and previous experiences. The barriers are trusting the concept, safety concerns, reverse logistics, data privacy, magnitude of detour, tracking and tracing, and travel time for participating in Crowd-Shipping.

For logistics companies, their willingness or perception of introducing Crowd-Shipping also depends on a few factors. The biggest driver for them to innovate or work differently is due to the

growth in e-commerce and growing demand for faster deliveries. However, for them to involve Crowd-Shipping as a concept to tackle the demand comes with additional factors that they need to consider. These include an efficient ICT platform, integrating their ongoing operations with Crowd-Shipping, expansion of operations, eco-friendly logistics, and developing or transitioning their business model accordingly. The companies may also face barriers with respect to the supply and demand regarding Crowd-Shipping, customer trust, safety concerns, pricing deliveries, reverse logistics and quality of service. Some of these drivers or barriers are influenced by what the crowd's perception of Crowd-Shipping is.

It has also been discovered through the literature review of the potential implications of regulatory bodies or legislative authorities on new innovations and in particular Crowd-Shipping. All innovations face regulations from the governments or local bodies in order to protect the citizens of a country from any wrong-doing. With regard to this, we have derived how wage laws can come into play if Crowd-Shipping is implemented. Also, data privacy concerns are present everywhere across the world and safety concerns which have already been mentioned is something that can be addressed by regulatory authorities through which Crowd-Shipping implementation is influenced. Business model innovation has been represented in the guiding framework, which is a concept that will also be explored thoroughly through the research. The Guiding Framework also helps us in giving a visual representation of the various aspects being studied and explored through the research.

The factors mentioned will be explored further through the research methodology which will consist of qualitative and quantitative methods. Through the methodology, we will also aim at deriving more drivers and barriers that influence Crowd-Shipping implementation, and practical viewpoints on business model innovation for Crowd-Shipping implementation. The Guiding Framework is shown in Figure 2 and research framework is shown in Figure 3.

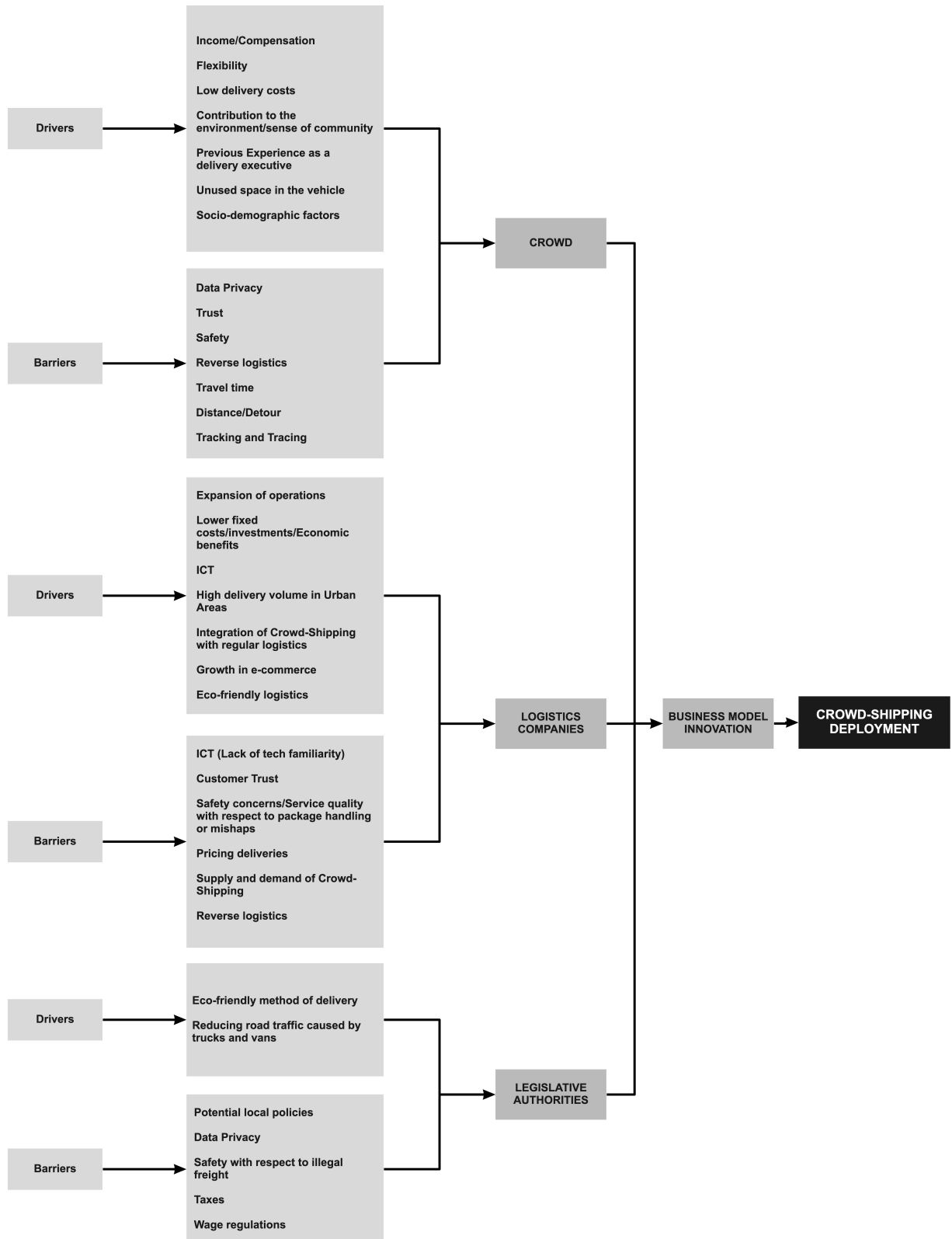


Figure 2: Guiding Framework

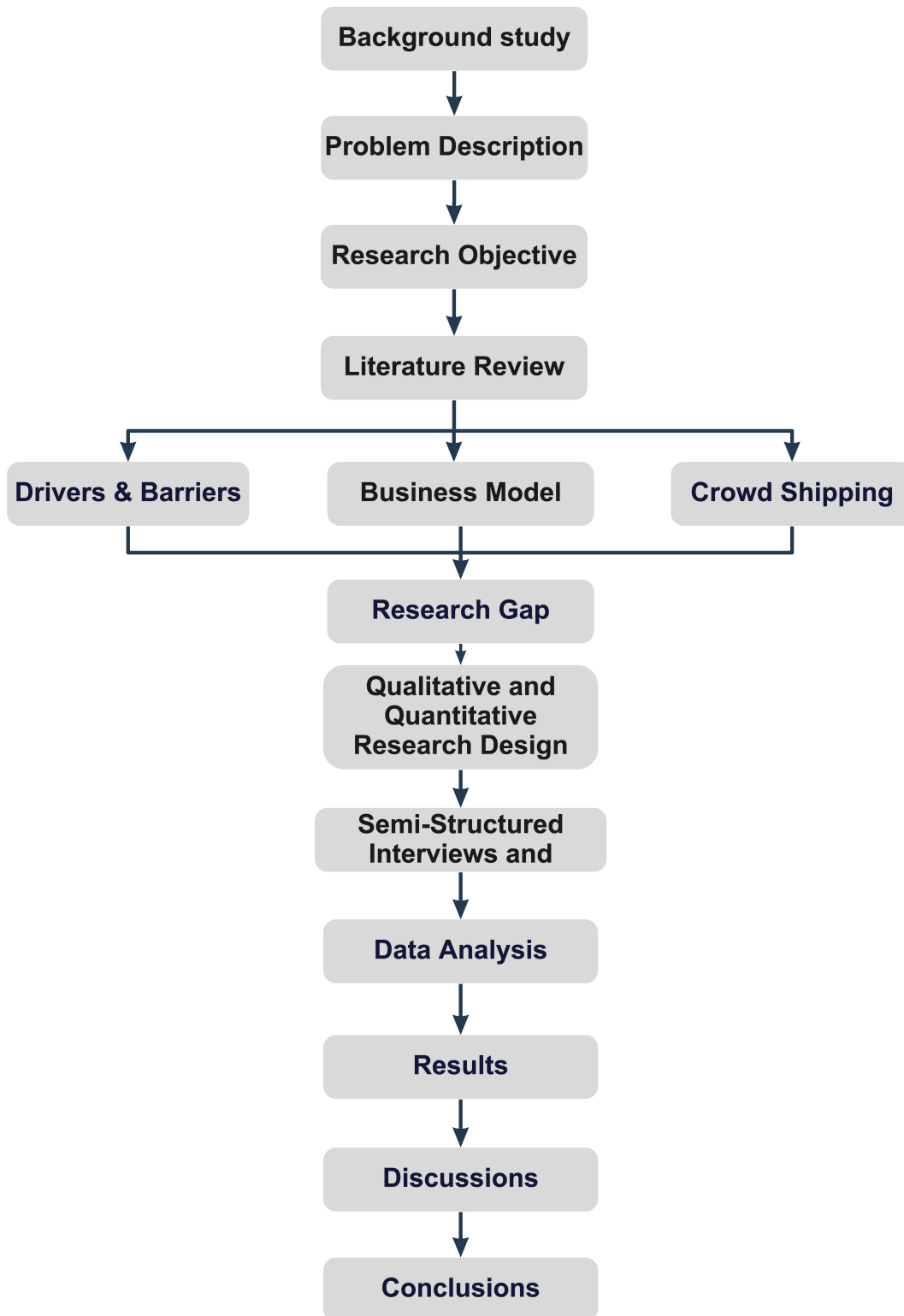


Figure 3: Research Framework

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## 3 Methodology

### 3.1 Introduction

The research to be conducted focuses on how Crowd-Shipping can be implemented in the Netherlands. The thesis will unfold what the drivers and barriers are, and what kind of business model would companies rely on to implement Crowd-Shipping. The stakeholder insight into these barriers, drivers and business models will be the main source of data for the research. Since the concept is new and research existing is nascent, this research can be classified as an exploratory research, which will be implemented through a set of interviews and surveys. In order to obtain the desired data and analyse them, a mixed method research design will be used for the data analysis, involving qualitative as well as quantitative methods.

### 3.2 Research Design

Since the research is going to be conducted flexibly and in a natural setting, qualitative research design will be ideal to achieve the research objective. Another advantage of qualitative research is the benefits it offers due to language assessment and the behaviour of the respondents (Sekaran & Bougie, 2016). Assessing the language of the interviewee will help in achieving deeper insight (Rahman, 2020) into developing the framework for the deployment of Crowd-Shipping while assessing respondent behaviour will provide more validation to the insight provided. In addition to the qualitative research design, a quantitative research design will be ideal to achieve the research objective with respect to the customer and occasional driver perspective on Crowd-Shipping. Due to the larger population size of customers and occasional drivers in comparison with logistics companies, surveys can capture more insight and provide more valid results as they can be carried out for a large sample size in a shorter period of time. Le & Ukkusuri (2018) and Punel & Stathopoulos (2017) are examples of research conducted using surveys to find out the occasional driver and customer perspectives on using Crowd-Shipping services.

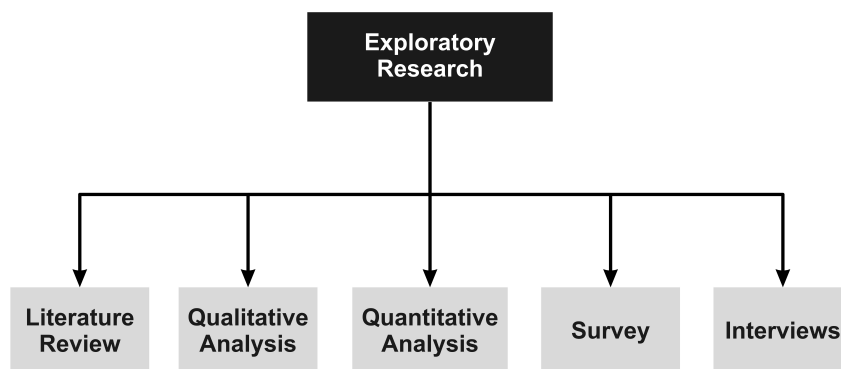


Figure 4: Research Design

### 3.3 Data Collection

Interviews are widely used methods in research to obtain information from appropriate respondents on a particular issue. An interview is as simple as a conversation between two people, which could have a guided structure or an open-ended structure, having a specific purpose, which is to understand certain insight provided by the respondents (Sekaran & Bougie, 2016). There are namely three types of interviews: unstructured, semi-structured and structured interviews. Unstructured interviews are interviews where the interviewer enters the setting without prior planning of the questions he/she may ask. The interviewer then introduces the broad objective of the interview and uses follow-up questions to begin gathering data that is required for the research. Structured interviews are the interviews where the interviewer enters the setting knowing exactly what kind of information needs to be gathered from the respondent. A set of prepared questions is usually asked to the respondent for this kind of an interview. Structured interviews are generally made up of three parts: an introduction, a set of questions or topics and follow-up or probing questions (Sekaran & Bougie, 2016).

The drawback of unstructured interviews is that while the interviewer relies on the progress of the conversation and follow up questions, he/she may realise that the problem to be investigated is deeper than expected, which causes hassle and may instigate the interviewer to conduct structured interviews further based on the answers received. Structured interviews face the drawback of basing the interview on available research, which then does not allow the interviewer to explore the respondents' point of view further (Sekaran & Bougie, 2016).

Semi-structured interviews are interviews where the researcher enter the interview questions with a set of pre-defined questions but also allows for the respondents to give their point of view on topics or questions that may arise apart from the pre-defined questions. These interviews are flexible but also allow for complexity and essentials to be understood by the interviewer. Semi-structured interviews will allow us to find out several barriers and enablers that have not been derived through the literature review through 'why' or 'how' questions (Sekaran & Bougie, 2016). Therefore, semi-structured interviews will be conducted to gather data from the concerned people to arrive at a set of obstacles and solutions for the deployment of Crowd-Shipping. To investigate the logistical and legislative perspectives, professionals from the logistics industry will be interviewed. For this, professionals from DHL, PostNL, NedCargo and other major logistics companies are being contacted.

To study the perspectives with respect to the crowd, a survey will be conducted for the people in the Netherlands. For the survey, questionnaires will be utilised to gather relevant information to develop the framework for Crowd-Shipping deployment. Questionnaires are pre-defined questions that seek answers from respondents, often with close alternatives. The use of questionnaires for the crowd is ideal, as this method of data collection is quick, can be administered to a large number of people and is relatively less expensive. The survey will be complete when the required number of responses are available through the questionnaires.

The type of questionnaire that will be administered is an online questionnaire. This will be



done using Google Forms, which is a tool by Google where a set of questions with desired scales can be framed and a link can be sent out to appropriate respondents. Due to the COVID-19 pandemic, administering questionnaires personally is not possible and online questionnaires come in handy during this period of time. Online questionnaires have a set of advantages. They are:

- Easily administered
- There is no distance barrier involved
- Quick delivery time
- Answers are processed automatically

However, there are a few drawbacks associated with online questionnaires. Sampling is a major issue. Since anyone can be an occasional driver or anyone can be a customer for e-commerce shopping, convenience sampling method will be used while sending out the survey. Other drawbacks include low response rates, ignorance of mails, text messages or other social media contact, and the low generalisability of the findings. An invitation for the survey along with an introductory passage explaining the concept of Crowd-Shipping and requesting people to fill the survey will be used to enable quick and adequate responses.

### **3.4 Interview Design**

Since the interviews conducted will be in a semi-structured form, the respondents could give us valuable insights that may not be related to the above-mentioned attributes. The data gathered will be analysed and suitable solutions will be developed for the framework. 5 logistical and legislative professionals/experts will be interviewed to derive the required insight for the barriers of Crowd-Shipping in the Netherlands. To ensure a valid sample size of the interviewees, 3 logistical professionals from the largest logistics companies in the Netherlands have been approached to conduct the interviews. One logistical expert from a start-up which focusing on Crowd-Shipping will be interviewed to understand the Crowd-Shipping from an innovative or start-up perspective. The interviews will be conducted through video-conferencing platforms such as Zoom and Microsoft teams after which transcripts will be noted down in order to begin the data analysis.

The research being qualitative will be conducted through a set of steps after the interviews and surveys are complete. The data gathered will be reviewed and explored. A suitable coding system will be developed through which these codes will be assigned to the data. Once the codes are assigned, repeating or recurring data will be identified through which we will be carrying out the further steps of identifying obstacles and developing solutions.

### **3.5 Survey Design**

The survey is designed in a mixed method way consisting of mostly quantitative questions with a few qualitative questions that request the respondent to fill in text data. The survey initially

gives an introduction Crowd-Shipping and focuses on the preferences of the respondent in terms of occupation, education, area of settlement, eco-friendliness and online shopping affinity. The next part of the survey focuses on some of the drivers and barriers associated with Crowd-Shipping, to which respondents were presented a likert rating scale between 1-5. The scale will determine the magnitude or the extent of the influence of these barriers and drivers associated with customers or occasional drivers willing to participate in Crowd-Shipping implementation. The final part of the survey consists of three open-ended questions where respondents can fill in their opinion of drivers and barriers, and suggestions for logistics companies while implementing Crowd-Shipping.

### 3.6 Data Analysis

In order to find a few factors to build the interview design and survey design, the literature review was manually analysed. This can be classified as secondary data collection as existing research was used to discover what influences Crowd-Shipping implementation. The drivers and barriers found in the literature review were used in the interviews and surveys to provide suitable context to the respondents who were picked for the data collection methods.

To analyse the data collected from semi-structured interviews, content analysis method was used. This method consists of a set of steps to make valid conclusions from text data. The first step used in content analysis is setting a coding scheme, which is basically assigning a code to a word, sentence or a paragraph of the data collected. This is known as open coding (Neuendorf & Kumar, 2015). Open coding can be conducted through a loose, tight or middle-ground approach. A loose approach is chosen when there are no pre-defined codes and each code is assigned during the data analysis. A tight approach is chosen when there are pre-defined codes which are not changed during the data analysis process. The middle-ground approach is the most suitable for this research as there will be a set of pre-defined codes along with codes that will be drawn while analysing the data (Sekaran & Bougie, 2016). The next step is to categorise these codes in a manner that is desired by the coder or research. These categories can be mutually exclusive or inclusive, based on the type of data collected. In the case of mutually exclusive categories, the validity of the data analysis is high, as the conclusions will not be dubious or repetitive. This categorising of codes is known as axial coding. After categorising the codes based on the desired data required, selective coding was implemented to draw the codes that are suitable for the final data analysis following which data was visualised to draw findings and conclusions (Neuendorf & Kumar, 2015).

For the content analysis, interviews conducted through the video-conferencing platforms such as Zoom and Microsoft Teams were recorded and converted into full transcripts. The transcripts have been summarised for the purpose of the report. The transcripts were further added to the Atlas.ti software, which is a software used for qualitative research analysis. The entire content analysis procedure was followed on Atlas.ti to derive findings and conclusions for the qualitative aspect of the research. For the business model perspective, the findings from the content analysis will be translated or visualised through the business model canvas tool.

For the surveys, quantitative analysis will be used to infer what barriers and drivers influence Crowd-Shipping. A descriptive statistics analysis and correlation analysis will be used for these surveys, which will show the extent of influence of the barriers and drivers in Crowd-Shipping implementation. Descriptive analysis is an important initial step to understand the distributions of data and identifying associations if any, among variables involved (Fisher & Marshall, 2009). Descriptive analysis can be provided for a single variable or multiple variables, depending on the types of these variables. Google spreadsheets and IBM-SPSS statistical tool was used to implement the descriptive analysis and also to discover possible correlations with the data obtained.

To check the face validity of the survey, the surveys were first sent out to a random sample of 20 respondents who were contacted and feedback was received. The wording of the questions were changed based on the feedback and the survey was ready to be sent out to the larger sample. Convenience sampling technique was used for the survey responses for both occasional drivers and customers. Approximately 400 people were contacted and the surveys were sent out through social media, email and messaging platforms. The customer survey received 104 responses while the occasional driver survey received 111 responses that were completely filled. For the sampling adequacy, the Kaiser-Meyer-Olkin measure test was conducted through which a value of 0.64 and 0.63 were achieved which is acceptable as it is above the minimum required value of 0.5 (Kaiser, 1970).

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## 4 Results

This chapter elaborates on the data analysis of the semi-structured interviews from the logistical and legal professionals as well as the surveys conducted for occasional drivers and customers. First, findings from all the semi-structured interviews and surveys will be provided and then a refined Guiding Framework will be derived through this. The interviewees have been given codes as the names and company names are anonymous. Table 1 shows the codes for interviewees as well as their roles within the companies.

Table 1: List of Interviews

Interview Number	Interviewee Code	Interviewee Designation	Company
1	I1	Operations Manager	A
2	I2	Supply Chain and Logistics Consultant	B
3	I3	Senior Logistics Manager	C
4	I4	Logistics Officer	D
5	I5	Policy Manager for Transportation and Logistics	

### 4.1 Findings from the Interviews

Four logistics professionals were interviewed to understand the drivers, barriers, and business models. First, the interviewees were asked to describe their role and positions in their respective companies and if they had knowledge on the concept of Crowd-Shipping. Through a series of questions relating to the key drivers and barriers found through the literature review, the interviewees were asked for their views. The results from the interviews and content analysis are as follows:

Speaking of the integration of traditional delivery services with Crowd-Shipping as a driver, we received conflicting views. I1 believes integration can be a driver depending on how Crowd-Shipping is used. According to Interviewee 1 (I1): *"Integration can be a driver only if the two would be divided appropriately. For example, our company uses trucks from the warehouses to sorting centres near the cities. The deliveries within the cities can be divided into Crowd-Shipped deliveries and a few vans"*. I2 suggested that a Crowd-Shipping like implementation with flex-contracts have already been in place for his company in case of heavy delivery demand. I3 believes that Crowd-Shipping can be utilised only for last-mile deliveries. She added: *"There's a lot of other work performed by our personnel and this will get affected by bringing in Crowd-Shipping if not integrated in a certain way"*.

Speaking of delivery pricing, according to I4, it should be based on several factors such as distance, time, area, etc. The interviewee added that the price of deliveries need to be analysed carefully in order to find a balance between providing the customers a reasonable price as well as ensuring adequate revenue to the companies and businesses. *"The main reason customers including consumers and businesses are open to these options are because of price agreements. The flexibility of matching your desired price is something that cannot be negotiated with other logistics companies"*. I1 and I3 had slightly different perspectives regarding pricing. In I1's words: *"Kilometres*

*evaluation for the occasional drivers would be the perfect way. You can also have a dynamic model like Uber, depending on peak hours and number of deliveries. How do you split this amount? The longer the drive is the more the occasional driver demands money even if the route is already fixed. You also want to be compensated for the time you lose for the detouring".* I3 added that occasional drivers' time cannot be valued by the companies so it would be up to the partners (businesses or customers).

The interviewees mentioned the influence of ICT on Crowd-Shipping, the interviewees emphasised on the importance of the application for several reasons. According to I4, *"The application is required to be simple and clear. Communication is priority and therefore the occasional drivers and customers need a clear and effective platform to be informed"*. In the view of I1: *"ICT can enable agreements between the customers and companies with respect to accepting a Crowd-Shipped package. The application thus makes it handy by enabling effective communication. The application also will enable live tracking which will provide my customers trustworthiness"*. I2 and I3's views on ICT are similar with respect to effective communication but slightly differs regarding tracking and tracing. I3 added *"ICT has the potential to solve the trust problem but in my experience, occasional drivers may not like to be tracked due to privacy concerns. However, time windows for the delivery can be and is already been given which gives customers a view of when their package can arrive"*.

The next driver that was mentioned was the expansion of operations with respect to the flow of services. In the interviews with logistical professionals, I1 and I3 propose that introducing a C2B (Consumer to Business) concept could be innovative and Crowd-Shipping could be a potential proposition for that flow of service. In the words of I1, *"I think a C2B would work well here. I am talking about the reverse logistics aspect. Back packages are growing due to e-commerce growth and the system could come in handy here."* I3 also suggests that *"C2B ensures no incurring of back-end costs for the company, so why not?"* At I4's company, the flow of services include B2B, B2C and C2C. I2 pointed out that his company in fact have provisions for 'back-packaging' or returning of packages as per their convenience but customers prefer pick-up points. Further, interviewees were asked about reverse logistics as a potential barrier. I4 adds *"Occasional drivers need to know when customers cannot be present during the time of delivery. Sometimes occasional drivers complete other tasks and come back to the absent customer but this cannot be the case always"*. He further added that the ICT applications helps in effective communication with respect to customer absence.

The growth of e-commerce operations and faster logistical services demand was mentioned in the introduction as a driver for Crowd-Shipping. Interviewee 2 (I2) stated: *"Let's not forget why we are talking about Crowd-Shipping, the growth in e-commerce operations. Without this, we would not look for other options for logistical activities"*. He further states that *"Not addressing e-commerce growth as a driver for Crowd-Shipping would not serve any meaning to the concept."* I1, I3 and I4 made similar statements regarding the growth in demand for package deliveries due to e-commerce growth. Existing literature emphasises on Crowd-Shipping being an eco-friendly method of logistics and last-mile deliveries. I1 questioned this claim: *"Are we actually going to save the environment with this concept?"* but further added different perspectives as a selling point for eco-friendliness. I4 suggested that: *"Eco-friendly and willingness of Crowd-Shipping are*

*positively correlated, especially in countries in Scandinavia and Northern Europe like Belgium and Netherlands.*” I3 had a different perspective to the eco-friendly factor and suggested that with the current increase in the use of bikes and electric vehicles by I3’s company, CS being an eco-friendly alternative is a short-term solution. According to I2, his company focus on greener logistics already and have been extremely efficient with the use of bicycles for small packages across cities in the Netherlands.

I5 gives us a legislative perspective speaking about the environmental laws that could drive Crowd-Shipping. These laws are to do with vans and trucks unable to enter city limits at certain times of the day. I5 states that *”In big cities, these laws are extremely serious. Trucks and vans need to ensure they finish their trips before a certain time in the morning and post a certain time of the night”*. There are also weight restrictions for these trucks and vans preventing them from entering some roads or streets in an area. *”Cars and bikes have almost zero restrictions which will allow a lot of businesses to take advantage of Crowd-Shipping will excel in this aspect”*. According to I5, there are a few policy goals of the government with respect to encouraging less traffic on the roads, driving lesser, incentivise eco-friendly measures and so on. Also, the Netherlands wants to move into complete zero-emissions on road by the year 2030. He believes these goals are drivers as well as potential barriers for Crowd-Shipping. Traffic laws and parking laws are standard for most vehicles, which will also apply for this concept. There is a barrier with respect to the possibility of regulations arising when the concept is fully deployed and gains ground according to I4 and I5. *”People may begin parking at all places if Crowd-Shipping happens. They already do in the case of Uber Eats, ThuisBezorgd. We need to add stricter parking rules in the future to curb this”*.

While mentioning the potential barrier of wage regulations in the Netherlands, I4 believes: *”The wage system will correct itself once Crowd-Shipping is implemented”*. I4’s company currently have three ways of paying wages to their occasional drivers. Also, the working hours for the occasional drivers need to be considered according to I2. *”The working hours load on some of our employees during peak pandemic was unfortunate. It led to exploitation to a great extent and we acknowledge the amount of work they put in during these tough times”*. I5 also suggests that there are regulations with respect to food safety need be considered as barriers as well. *”Companies implementing Crowd-Shipping need to be wary of the occasional drivers handling food items and alcohol while delivering as these items are heavily regulated”*.

Speaking of other barriers, another barrier emphasised upon was the supply and demand of Crowd-Shipping. I4 mentioned that, Crowd-Shipping if deployed, will depend upon the number of occasional drivers who have the time and space to complete the delivery but also their willingness to do it, provided the several factors involved within this willingness. According to I1, I2, I3, and I4, Customer willingness is the next barrier, which complements the barrier of supply of occasional drivers. Through the interview with I4, it is noted that finding trusted occasional drivers is a barrier, especially when B2B transactions take place. I2 suggests that people’s occupations may result in the supply and demand of Crowd-Shippers fluctuate. In the words of I4, *”B2B transactions demand full trust and compliance as these transactions may sometimes amount to large money. We need to make sure that our occasional drivers are trusted and the supply is there. If not, we do the tasks ourselves”*.

According to I4, the proposition of flexibility being a driver, can potentially be a barrier. According to I4, "Sometimes early delivery is not always the best, people usually demand quick and time efficient deliveries but that poses a challenge of finding occasional drivers suitable for their requested time frame". I1, I2 and I3 suggest that flexibility is one of the biggest drivers for Crowd-Shipping especially if companies want to implement the concept. When asked about reducing costs if Crowd-Shipping is implemented, I1 and I3 mention that costs will in fact be incurred by logistics companies and are a barrier to the implementation of Crowd-Shipping. I1 suggests: *"Our employees who drive also perform several other tasks such as warehouse work, loading, unloading and sorting. We will have to invest more money in occasional drivers than regular drivers because occasional drivers will not offer us anything more"*. He further adds: *"The Crowd-Shippers could be biting into a bigger piece of our pie compared to our employees"*. I3's view on this is found to be similar: *There is a lot of unnoticed work that these employed drivers perform and due to that, our margins may become lower by incorporating Crowd-Shipping"*.

According to I5, built environment and real estate is another challenge and a potential driver that companies can face if willing to implement Crowd-Shipping. He suggests that to ensure efficient Crowd-Shipping operations while keeping in mind that occasional drivers may not be too attracted to taking too many detours, companies may find the challenge of locating their warehouses or hubs strategically to facilitate smooth pick-up and delivery of packages through Crowd-Shipping. I5 claims *"The real estate barrier may also serve as an opportunity to companies, but it is indeed a barrier to accommodate a smooth functioning by bringing in the right investments"*. I1's view on costs incurred had a similar view and suggested that resources such as e-bikes, small warehouses and so on would be required to facilitate Crowd-Shipping.

According to I2, I3 and I5, 'Image' of the company or the brand value of the big logistics companies is also a barrier. According to I2, companies are extremely possessive about the image that they have to an extent that they have copyrights over the colour of their logo. *"We have taken steps to make everything about the company unique, like the colour schemes and shapes"*. I1 added: *"this is especially due to the fact that occasional drivers are not trained in handling packages the way regular delivery personnel are trained. This could tarnish our image in case of any negative circumstances"*. I1's statement also addressed the barrier of safety concerns with package handling.

Another barrier that was addressed through the interviews is Data Privacy. I4 emphasises on this factor: *"Usually occasional drivers don't care about the numbers and addresses. It's all a matter of customer willingness and how they see this. After deploying and a few occasions of successful deliveries, customers will come into terms like how they did with Uber or AirBnb"*. I1 noted that privacy related issues can be resolved with agreements on the ICT application. I3 believes privacy issues concern occasional drivers more than customers especially with live tracking. However, I1, I3 and I4 point out to customer trust as a barrier that can be faced while implementing Crowd-Shipping. Although data privacy issues could be a potential barrier, the Netherlands currently does not have regulations with respect to data privacy in the delivery and specifically the Crowd-Shipping domain as per I5. He claims that these barriers fall back on customers and their willingness to accept this form of logistics as a relevant and legitimate delivery system. The final legislative barrier mentioned in the interview by I5 is the fact that all vehicles

have to be completely electric by the year 2030, according to the Paris Climate Agreement.

According to I2 and I5, the social security factor is extremely high in the Netherlands as compared to other countries in the world. *"Companies have the duty of taking care of their employees. In the case of Crowd-Shipping, companies may have to carefully deduce a plan for existing employees and their existing benefits to not be affected by Crowd-Shippers". Even flex contract drivers who work for organisations such as UberEats or ThuisBezorgd are not completely protected from their companies".*

## 4.2 Findings from the Survey

For the survey, potential occasional drivers and customers were reached out to through an electronic questionnaire utilising social media as a medium. The survey was sent out to close to 400 people with 216 people responding. 111 people responded for the customer perspective and 104 people responded for the occasional driver perspective. A number of factors from the literature review and the interviews were taken into consideration while framing the questions and the findings from the survey will highlight these factors and determine how much customers and drivers consider them while receiving and dropping off a package respectively.

### 4.2.1 Customers

A total of 104 responses were received for the customer perspective on Crowd-Shipping implementation. Out of these, 36.5% are full-time employees, 33.7% are students while the rest comprise of part-time employees, homemakers, unemployed and retired people. 62.9% were familiar with Crowd-Shipping as a concept while 77.1% have used services like UberEats and Nimber earlier and 84.8% have used shared economy platforms such as Airbnb and Uber ride sharing earlier. For being environmental friendly (n=104), the mean was found to be 3.98 with a minimum score of 1 and a maximum score of 5. The standard deviation is observed to be 0.935. To find out what are the items customers would be most comfortable with while accepting a Crowd-Shipped package, majority of the people picked items such as books, clothes and household items as appropriate items to be received from Crowd-Shipping implementation. Categories such as electronics and Jewellery, usually highly priced, were the least chosen categories from the customers.

The next part of the questionnaire contained questions based on drivers and barriers that potentially determine customers willingness towards receiving a Crowd-Shipped package. These questions were asked on a likert scale ranging from 1-5, 1 being strongly disagree and 5 being strongly agree. For customer willingness based on the driver of availability of delivery occasional drivers' details (name, email address and phone number), a mean value of 4.34 (n=104) was observed with a standard deviation of 0.931. With respect to delivery charges in comparison with traditional delivery charges, the mean value observed was 4.39 (n=104) with a standard deviation of 0.806.

Based on the driver of helping people find an income (sense of community), the customer



What is your profession or occupation?

104 responses

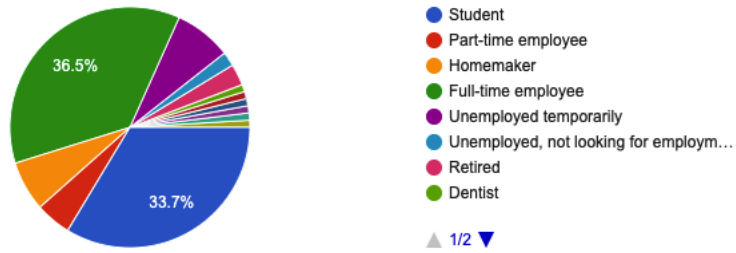


Figure 5: Profession of the Customers

Are you familiar with the concept of Crowd-Shipping?

104 responses

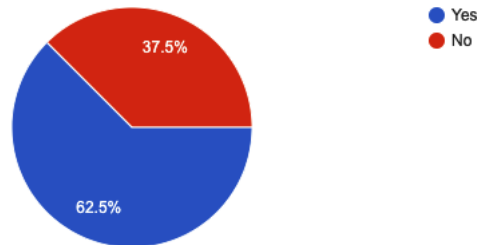


Figure 6: Familiarity with Crowd-Shipping

Have you utilized Crowd-Shipping services before? (UberEats, Nimber, Dunzo, etc.)

104 responses

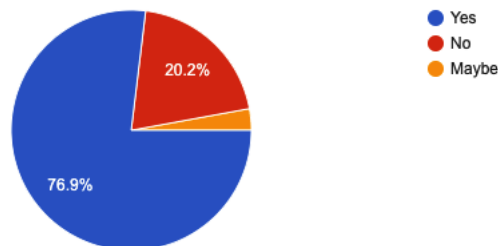


Figure 7: Used Crowd-Shipping Services Before

responses had a mean value of 3.98 (n=104) with a standard deviation of 1.174. Another driver related to sense of community was the contribution to the environment by enabling lower carbon emissions through Crowd-Shipping. The mean value achieved was 4.12 (n=104) with a standard deviation of 1.017. When asked about the driver of flexibility, the responses had a mean value of 4.46 (n=104) with a standard deviation of 0.8. The weight and size of the package and value of the package gave mean values of 3.16 (n=104) and 4.00 (n=104) with standard deviations of 1.422 and 1.052 respectively.

Have you used Shared Economy platforms before? (Uber ride sharing, Airbnb, Marketplace, etc.)

104 responses

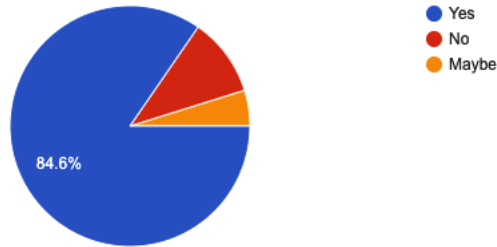


Figure 8: Used Shared Economy Platforms Before

Further, questions were asked with respect to barriers found in the research. When asked about the number of packages that the delivery driver may have to deliver, customers responses had a mean value of 3.6 ( $n=104$ ) and a standard deviation of 1.376. Customers willingness based on safety of the package was observed to have a mean value of 4.32 ( $n=104$ ) and a standard deviation of 1.054 in comparison with a mean value of 3.60 ( $n=104$ ) and standard deviation of 1.219 for customers willingness based on privacy concerns. Willingness based on the availability of insurance achieved a mean value of 4.41 ( $n=104$ ) and standard deviation of 0.843. When asked about the willingness based on occasional drivers' previous experience, and the size and reputation of the company (big firm vs start-up), mean values of 3.57 ( $n=104$ ) and 3.85 ( $n=104$ ) with standard deviations of 1.313 and 1.260 respectively, were observed. If occasional drivers' ratings or reviews are provided, customer willingness achieved a mean value of 4.20 ( $n=104$ ) with a standard deviation of 1.074. Table 2 shows all the values of descriptive statistics for the customer survey.

To gain some additional feedback from the respondents, three open questions were formulated at the end asking for any other factors, barriers and suggestions. Respondents mostly answered these questions with no/none. However, a few of the answers that were important are taken as findings for the survey. Customers would also prefer Crowd-Shipped parcels to be pilferage proof and secure. An interesting barrier that was received in the open questions speaks of how Crowd-Shipping may be an easy way to offload employees without fair compensations. A few customers also prefer having real-time tracking details of the occasional driver in addition of details such as phone number and email address.

Table 2: Descriptive Statistics for Customers' Survey

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance	Skewness		Kurtosis	
					Statistic	Std. Error			Statistic	Std. Error	Statistic	Std. Error
Eco-friendly	104	4	1	5	3.98	0.092	0.935	0.873	-0.689	0.237	0.006	0.469
Availability of occasional driver details	104	4	1	5	4.34	0.091	0.931	0.866	-1.683	0.237	3.103	0.469
Delivery Charges	104	4	1	5	4.39	0.079	0.806	0.649	-1.523	0.237	2.800	0.469
Sense of Community (income help)	104	4	1	5	3.98	0.115	1.174	1.378	-1.247	0.237	0.779	0.469
Sense of Community (reducing carbon emissions)	104	4	1	5	4.12	0.100	1.017	1.035	-1.194	0.237	1.080	0.469
Weight and Size of the package	104	4	1	5	3.16	0.139	1.422	2.022	-0.191	0.237	-1.251	0.469
Value of the package	104	4	1	5	4.00	0.103	1.052	1.107	-0.918	0.237	0.086	0.469
Flexibility provided	104	4	1	5	4.46	0.078	0.800	0.639	-1.848	0.237	4.043	0.469
Number of packages to be delivered	104	4	1	5	3.60	0.135	1.376	1.894	-0.626	0.237	-0.805	0.469
Safety concerns	104	4	1	5	4.32	0.103	1.054	1.112	-1.582	0.237	1.743	0.469
Insurance provided	104	4	1	5	4.41	0.083	0.843	0.711	-1.506	0.237	2.198	0.469
Occasional drivers' reviews	104	4	1	5	4.20	0.105	1.074	1.153	-1.661	0.237	2.466	0.469
Privacy concerns	104	4	1	5	3.60	0.120	1.219	1.486	-0.425	0.237	-0.796	0.469
Occasional drivers' experience	104	4	1	5	3.57	0.129	1.313	1.724	-0.648	0.237	-0.631	0.469
Size and reputation of the company	104	4	1	5	3.85	0.124	1.260	1.588	-0.862	0.237	-0.348	0.469

To identify relationships or connections between the items in the customers' survey, correlation analysis was conducted. The results from the correlation analysis are noted below. For environmental friendliness and sense of community by helping people earn income, the correlation is positive, of weak magnitude and significant, therefore positively relating to each other. For environmental friendliness and sense of community by reducing carbon emissions, the correlation is positive, of weak magnitude and significant, therefore positively relating to each other. Environmental friendliness and the number of packages to be delivered by the occasional driver has a positive correlation of moderate magnitude and significant, and therefore positively relate to each other. Finally, environmental friendliness and privacy concerns also show a positive correlation of weak magnitude and is significant, and are positively related to each other.

The availability of occasional driver details and delivery charges are found to have a positive correlation of moderate magnitude and significant, therefore positively relating to each other. The availability of occasional driver details and flexibility provided by Crowd-Shipping are also found to have a positive correlation of moderate magnitude and significant, positively relating to each other. Safety concerns and the availability of occasional driver details are found to be positively correlated with a moderate magnitude and significant, positively relating to each other. The availability of occasional driver details is also positively correlated with the availability of insurance, having a moderate magnitude and significant, positively relating to each other.

Delivery charges and the value of the package are positively correlated with a moderate magnitude and significant, therefore positively relating to each other. Delivery charges and flexibility offered are positively correlated with a moderate magnitude and significant, therefore positively relating to each other. Delivery charges and safety show positive correlation with weak magnitude and significant, therefore positively relating to each other. Finally, delivery charges and insurance availability are found to be positively correlated with weak magnitude and significant, therefore positively relating to each other. Sense of community with respect to income help shows positive correlation of moderate magnitude with sense of community with respect to reducing carbon emissions and significant, therefore positively relating to each other. Sense of community with respect to income help shows positive correlation of moderate magnitude with the weight and size of the package and significant, therefore positively relating to each other. Finally sense of community based on income help shows positive correlation of weak magnitude with the number of packages to be delivered and is significant, and are positively related to each other.

Sense of community with respect to carbon emissions and weight and size of the package are positively correlated with moderate magnitude, significant, and therefore positively relate to each other. Sense of community with respect to carbon emissions and flexibility are positively correlated with weak magnitude, significant, and therefore positively relate to each other. Sense of community with respect to carbon emissions and number of packages to be delivered are positively correlated with moderate magnitude, significant, and therefore positively relate to each other. Weight and size of the package and the number of packages to be delivered are positively correlated with a weak magnitude, significant, and therefore positively relate to each other. Weight and size of the package and the occasional drivers' ratings are positively correlated with a weak magnitude, significant, and therefore positively relate to each other. Package value is positively correlated with flexibility

with weak magnitude and is significant, therefore positively relating to each other. Package value is positively correlated with the number of packages to be delivered with moderate magnitude and is significant, therefore positively relating to each other. Package value is positively correlated with safety of the package with weak magnitude and is significant, therefore positively relating to each other. Package value is positively correlated with insurance with weak magnitude and is significant, therefore positively relating to each other. Package value is positively correlated with occasional drivers experience with weak magnitude and is significant, therefore positively relating to each other.

Flexibility and number of packages to be delivered show positive correlation with weak magnitude, significant, therefore positively relating to each other. Flexibility and safety show positive correlation with moderate magnitude, significant, therefore positively relating to each other. Flexibility and insurance show positive correlation with moderate magnitude, significant, therefore positively relating to each other. The number of packages to be delivered and privacy show positive correlation with moderate magnitude, significant and therefore positively relate to each other. The number of packages to be delivered and previous delivery experience show positive correlation with weak magnitude, significant and therefore positively relate to each other. Safety of the package and insurance are positively correlated with moderate magnitude and significant, therefore positively relating to each other. Data privacy and delivery experience are positively correlated with moderate magnitude and significant, therefore positively relating to each other. Finally, delivery experience and company size are positively correlated with moderate magnitude and significant, therefore positively relating to each other. The values of correlations and significance levels are shown in Table 3.

Table 3: Correlations for Customer Survey

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Eco-friendly	-														
2	Availability of occasional driver details	0.186	-													
3	Delivery Charges	0.152	.313**	-												
4	Sense of Community (income help)	.247*	-0.038	-0.012	-											
5	Sense of Community (reducing carbon emissions)	.298**	0.112	0.051	.603**	-										
6	Weight and Size of the package	.251*	0.046	0.045	.444**	.369**	-									
7	Value of the package	0.188	0.139	.412**	-0.055	0.172	0.149	-								
8	Flexibility provided	0.142	.468**	.333**	0.041	.256**	0.044	.208*	-							
9	Number of packages to be delivered	.311**	0.191	0.145	.296**	.450**	.247*	.329**	.224*	-						
10	Safety concerns	0.144	.375**	.206*	-0.003	0.192	-0.061	.280**	.539**	0.163	-					
11	Insurance provided	0.096	.390**	.215*	-0.002	0.182	0.048	.230*	.391**	0.162	.604**	-				
12	Occasional drivers' reviews	-0.064	-0.049	0.154	0.142	-0.030	.226*	0.086	0.094	0.115	0.149	0.121	-			
13	Privacy concerns	.232*	0.087	0.006	0.090	-0.025	0.106	0.136	0.004	.301**	-0.066	-0.129	0.100	-		
14	Occasional drivers' experience	-0.031	0.104	0.126	-0.018	0.060	0.085	.197*	0.044	.257**	-0.026	0.093	0.007	.308**	-	
15	Size and reputation of the company	-0.003	0.160	0.051	-0.068	-0.130	-0.002	0.161	0.110	-0.031	0.147	0.152	0.138	0.111	.364**	-

Note: \* indicates significant correlations at  $p < 0.05$  level.

\*\* indicates significant correlations at  $p < 0.01$  level.

### 4.2.2 Occasional Drivers

A total of 111 responses were received for the survey conducted for potential occasional drivers. Out of these 44.7% are full-time employees, 28.1% are students and the rest comprise of part-time employees, homemakers, unemployed, retired and self-employed. 65.8% of the respondents are familiar with the concept of Crowd-Shipping among which about 50% have utilized Crowd-Shipping services before through platforms such as Nimber and UberEats. Around 77% potential occasional drivers consider themselves as environmental friendly and 62.3% of them take steps to curb carbon footprints in the society.

What is your profession or occupation?

111 responses

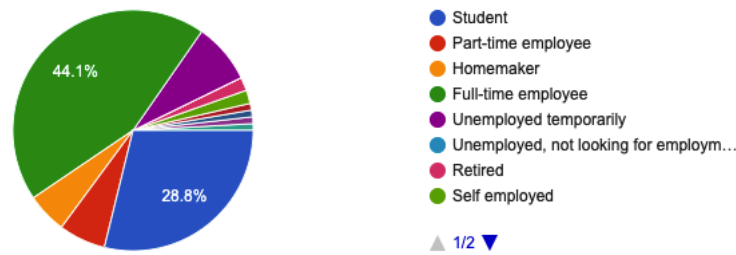


Figure 9: Occasional Drivers' Profession

Are you familiar with the concept of Crowd-Shipping?

111 responses

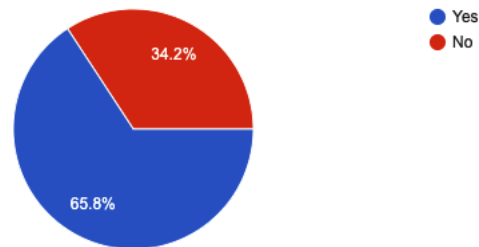


Figure 10: Occasional Drivers Familiarity with Crowd-Shipping

The next part of the questionnaire contained questions regarding the drivers and barriers for potential occasional drivers' willingness to participate in Crowd-Shipping services. Based on the driver of additional income, the responses had a mean value of 3.34 (n=111) with a standard deviation of 1.468. The next driver was the potential of reducing carbon emissions through participating in Crowd-Shipping for which the mean value was observed to be 3.66 (n=111) with a standard deviation of 1.247. With respect to the potential challenge regarding weight and size of the package, the responses from potential occasional drivers had a mean value of 3.57 (n=111) with a standard deviation of 1.392. As the number of packages can vary from single to multiple, the willingness of occasional drivers based on this had a mean value of 3.59 (n=111) and a standard deviation of 1.384. Time taken and magnitude of detour were found to be barriers and for this, potential occasional drivers' responses had mean values of 3.79 (n=111) and 4.04 (n=111) with

standard deviations of 1.329 and 1.206 respectively. If insurance is provided for the occasional drivers or packages, occasional drivers willingness obtained a mean value of 3.91 (n=111) and standard deviation of 1.352. Considering the geographical setting of the deliveries, the responses had a mean value of 3.29 (n=111) and standard deviation of 1.492. When asked about the barrier of live tracking, the responses received had a mean value of 2.97 (n=111) with a standard deviation of 1.474. Finally, willingness based on the reputation of the company that occasional drivers may work for received a mean value of 3.97 (n=111) with a standard deviation of 1.247. Table 4 shows all the values of descriptive statistics for the occasional driver survey.

As with the customer survey, the survey for the occasional drivers also had 3 open questions in the end to find out if the respondents had other factors, barriers and suggestions in mind. Reverse logistics is pointed out as a concern with a respondent questioning what happens to the package if customers are unavailable. A few respondents also prefer to know what lies in the package to avoid dealing with illegal substances or products like narcotics and arms. A few respondents also pointed out at requiring optimised routes for the deliveries performed.



Table 4: Descriptive Statistics for Occasional Drivers' Survey

	N Statistic	Range Statistic	Minimum Statistic	Maximum Statistic	Mean		Std. Deviation Statistic	Variance Statistic	Skewness		Kurtosis	
					Statistic	Std. Error			Statistic	Std. Error	Statistic	Std. Error
Eco-friendly	111	4	1	5	4.09	0.090	0.949	0.901	-1.027	0.229	0.860	0.455
Additional income/Compensation	111	4	1	5	3.34	0.139	1.468	2.154	-0.351	0.229	-1.259	0.455
Sense of Community (reducing carbon emissions)	111	4	1	5	3.66	0.118	1.247	1.554	-0.554	0.229	-0.654	0.455
Weight and Size of the Package	111	4	1	5	3.57	0.132	1.392	1.939	-0.626	0.229	-0.909	0.455
Number of Packages to be delivered	111	4	1	5	3.59	0.131	1.384	1.916	-0.598	0.229	-0.907	0.455
Time taken for deliveries	111	4	1	5	3.79	0.126	1.329	1.766	-0.889	0.229	-0.392	0.455
Magnitude of detour	111	4	1	5	4.04	0.114	1.206	1.453	-1.117	0.229	0.231	0.455
Insurance availability	111	4	1	5	3.91	0.128	1.352	1.828	-1.025	0.229	-0.160	0.455
Geographical setting of deliveries	111	4	1	5	3.29	0.142	1.492	2.225	-0.325	0.229	-1.289	0.455
Live tracking by companies	111	4	1	5	2.97	0.140	1.474	2.172	0.030	0.229	-1.303	0.455
Reputation of the company	111	4	1	5	3.97	0.118	1.247	1.554	-1.153	0.229	0.353	0.455

To identify relationships or connections between the items in the occasional drivers' survey, correlation analysis was conducted. The results from the correlation analysis are noted below. Environmental friendliness and sense of community with respect to carbon emissions are positively correlated with weak magnitude, significant and therefore positively relate to each other. Environmental friendliness and the magnitude of deviation are negatively correlated with weak magnitude, significant and therefore negatively relate to each other. For willingness to work based on additional income and sense of community with respect to carbon emissions, there is a positive correlation with moderate magnitude, significant and therefore positively relate to each other. For willingness to work based on additional income and time taken to perform deliveries, there is a positive correlation with weak magnitude, significant and therefore positively relate to each other. For willingness to work based on additional income and live tracking, there is a positive correlation with weak magnitude, significant and therefore positively relate to each other. Finally, For willingness to work based on additional income and company reputation, there is a positive correlation with moderate magnitude, significant and therefore positively relate to each other.

Sense of community with respect to carbon emissions and live tracking are positively correlated with weak magnitude, significant and therefore positively relate to each other. Sense of community with respect to carbon emissions and live tracking are positively correlated with moderate magnitude, significant and therefore positively relate to each other. Weight and size of the package and the number of packages to be delivered are positively correlated with a moderate magnitude, significant and therefore positively relate to each other. Weight and size of the package and the time taken for deliveries are positively correlated with a moderate magnitude, significant and therefore positively relate to each other. Weight and size of the package and the detour for deliveries are positively correlated with a moderate magnitude, significant and therefore positively relate to each other. Weight and size of the package and the insurance for the package are positively correlated with a weak magnitude, significant and therefore positively relate to each other. Weight and size of the package and the geographical setting for the deliveries are positively correlated with a moderate magnitude, significant and therefore positively relate to each other.

The number of packages to be delivered is positively correlated with time taken for deliveries with moderate magnitude and is significant, therefore positively relating to each other. The number of packages to be delivered is positively correlated with detour for deliveries with moderate magnitude and is significant, therefore positively relating to each other. The number of packages to be delivered is positively correlated with insurance for deliveries with moderate magnitude and is significant, therefore positively relating to each other. The number of packages to be delivered is positively correlated with geographical setting for deliveries with moderate magnitude and is significant, therefore positively relating to each other. The number of packages to be delivered is positively correlated with company reputation for deliveries with moderate magnitude and is significant, therefore positively relating to each other.

Time taken to perform deliveries and detour required for deliveries are positively correlated with a moderate magnitude and is significant, therefore positively relating to each other. Time taken to perform deliveries and insurance for packages are positively correlated with a moderate magnitude and is significant, therefore positively relating to each other. Time taken to perform deliveries

and geographical setting for deliveries are positively correlated with a moderate magnitude and is significant, therefore positively relating to each other. Time taken to perform deliveries and the company reputation are positively correlated with a weak magnitude and is significant, therefore positively relating to each other. Deviation or detour required for deliveries and insurance provided are found to have a positive correlation with moderate magnitude and is significant, therefore positively relating to each other. Insurance provided and geographical setting of deliveries are found to have a positive correlation with moderate magnitude and is significant, therefore positively relating to each other. Insurance provided and live tracking of deliveries are found to have a positive correlation with weak magnitude and is significant, therefore positively relating to each other. Insurance provided and reputation of the company are found to have a positive correlation with moderate magnitude and is significant, therefore positively relating to each other. Finally, geographical setting of the deliveries and live tracking are observed to have a positive correlation with moderate magnitude, significant and therefore positively relate to each other. The values of correlations and significance levels are shown in Table 5.

Table 5: Correlations for Occasional Drivers' Survey

		1	2	3	4	5	6	7	8	9	10	11
1	Eco-friendly	-										
2	Additional income/Compensation	-0.166	-									
3	Sense of Community (reducing carbon emissions)	.257**	.373**	-								
4	Weight and Size of the Package	0.078	-0.065	0.176	-							
5	Number of Packages to be delivered	0.076	0.118	0.087	.564**	-						
6	Time taken for deliveries	-0.122	.265**	0.116	.305**	.611**	-					
7	Magnitude of detour	-.217*	-0.038	0.039	.383**	.466**	.555**	-				
8	Insurance availability	-0.072	0.103	0.116	.288**	.349**	.364**	.303**	-			
9	Geographical setting of deliveries	0.078	-0.025	0.122	.398**	.339**	.338**	0.176	.319**	-		
10	Live tracking by companies	-0.141	.210*	.227*	0.140	0.186	0.141	0.047	.245**	.326**	-	
11	Reputation of the company	0.087	.318**	.386**	0.182	.326**	.227*	0.152	.506**	0.180	0.143	-

Note: \* indicates significant correlations at  $p < 0.05$  level.

\*\* indicates significant correlations at  $p < 0.01$  level.

### 4.3 Findings from the Interviews for Business Model Innovation

To implement Crowd-Shipping, start-ups undergo a business model innovation phase. Based on the interview with I4, the company has built a business model that sells differently to different stakeholders. *"To investors we are an IT company with a platform that can be used worldwide but for customers we push the green, cheap and flexible propositions"*. With respect to innovation from the Crowd-Shipping view, I4 believes their B2B platform is innovative. *"Business platform. The B2B platform would be suitable innovation. Also, integrating or tying up with different business platform such as marketplace, where traditional logistics would not be feasible, is the company's view on innovation. Flexibility is an important aspect in this. The bigger logistics companies are not flexible enough for operations in this scale. Crowd-Shipping platforms can offer this flexibility"*. In order to make the ideal offer on the table, I4 suggests the need to sell their product based on three factors:

1. Better service or Equal service
2. Safety
3. On-time delivery

The value proposition of the start-up for the consumers focuses on providing green logistics which is deliveries using electric vehicles or public transport. In case of the occasional driver not having access to electric vehicles, the start-up also provides electric cars, which need to be returned when delivery activities are completed on the same day or as per convenience if the occasional drivers are regular and trusted. *"Some of the occasional drivers can take the car home if we know them from earlier. We trust these occasional drivers to do the right thing"*. The revenue streams for the start-up include service charges for each delivery, insurance fee to ensure packages are insured and other variables with respect to the ICT platforms that are usually seen.

To summarise the qualitative findings on the business model canvas components, the following are the key takeaways:

1. Key Partners: The key partners for the start-up environment implementing Crowd-Shipping would be businesses, investors and trusted occasional drivers.
2. Key Activities: Customer-occasional driver matching, pricing, and delivery activities are the key activities that are executed by start-ups in the Crowd-Shipping process.
3. Key Resources: The key resources for the business model will consist of human resources. Occasional drivers and company employees come within the human resources. An ICT application is the only medium to enable the working of the process. Financial resources and infrastructure in terms of real estate and transportation are also key resources.
4. Key Propositions: The key propositions are two-dimensional. One is an IT model that can be used in most countries. The second dimension is customer oriented, focusing on promoting greener logistics, cheaper delivery, providing insurance and flexible delivery.

5. Customer Relationships: In the case of this start-up, customer relationships are based on delivering the value propositions consistently and building an element of trust and loyalty by doing so. The relationship is also based on green logistics proposition, which the expert believes can be realistically achieved in countries with higher affinity towards the environment.
6. Channels: Channels include the ICT platform, and customer service provisions.
7. Customer Segments: Any person using e-commerce or online shopping can be a customer. Customers who also prefer in-store shopping can sometimes make use of the service during adverse situations like the pandemic.
8. Cost Structure: Costs incurred by the company are mainly for the key resources. Marketing costs add on to the other costs mentioned.
9. Revenue Streams: The revenue streams are mainly the service charges incurred by customers for each delivery and the insurance fee that will be charged for the customers to ensure safety and trust. Business negotiation for large consignments are also a source of revenue for the company.

#### **4.4 Findings from the Interviews for Business Model Transition**

Business Model Innovation does not only mean developing a business model for companies that do not have one, it can also mean transitioning of a company's business model by making some changes with respect to the various existing business model elements (Geissdoerfer, Vladimirova, & Evans, 2018). As per the interviews conducted with the logistical experts from the big logistics companies, their companies will have to go through a transition phase if Crowd-Shipping were to be incorporated as an additional service provided.

According to I3, the current business model is based on loyalty of the customers and serving this loyalty with an element of trust and a subscription model which enables cheaper deliveries through a discount model. The company also specialises in optimised routing by utilising the traffic laws of countries to their strength. According to I2, the big logistics company based in the Netherlands focuses on three core activities in their business model namely: collecting, sorting and delivery. By means of an efficient network and partners, I2 suggests to be moving into greener logistical activities through greener supply chains. Finally, I1's business model is wide ranged, providing services and solutions in several domains. In the e-commerce and parcel delivery domain, I1 claims that they aim to follow their mission through trust, credibility and efficiency. The company is also on a transition phase with respect to acquiring a greener fleet to ensure the climate change goals are met in the future and customers will be able to trust this change.

Through the interviews with I1, I2, I3 and I4, the most common drivers that they believe can help companies sell Crowd-Shipping are greener logistics, flexibility and cheaper delivery charges. However, the experts do feel that these factors may not always be the case. The experts also believe that the margin of profits companies are making currently with employed drivers will be more than the profit that Crowd-Shipping can bring to the plate. The experts believe that incorporating

Crowd-Shipping could potentially make their company's credibility take a hit. *"Usually people see our vans and trucks and know their parcels are safe and sound but when they see a vehicle which is blank, without any labels, they may not completely trust the service or safety provided"*.

There are also other aspects that were derived through the interviews with respect to business model transition. I2 and I5 believe that Netherlands is one of the best countries in terms of logistical infrastructure due to its geographical size and highly efficient stakeholders. According to I1, Crowd-Shipping can potentially require his company to set up warehouses in locations suitable for this service, big cities for example.

I1 and I3 believe the companies can also look into different types of services such as C2B, through Crowd-Shipping. I1 believes that taxi drivers who drive around the city throughout the day in urban areas can come in handy for these activities. Another aspect of transition according to the expert is enabling occasional drivers to use their e-bikes or bicycles in urban areas for deliveries. I4 reveals that his company is currently monitoring the possibilities of an integration with marktplaats (marketplace) in the Netherlands. I3 suggested a similar opportunity for Crowd-Shipping implementation in the Netherlands.

The summary of the qualitative findings are shown in the form of tables consisting of example quotes relating to each driver (Table 6) and barrier (Table 7).

Table 6: Example Quotes for Drivers

Driver	Example Interview Quotes	Interviewee Code	Frequency
Growth of e-commerce	"Let's not forget why we are talking about Crowd-Shipping: The growth in e-commerce operations. Without this, we would not look for other options for logistical activities"	I1, I2, I3, I4	4
Insurance	"Insurance is the biggest driver. Customers would feel way more comfortable if there is adequate insurance. But who takes the blame, the driver or the company? This needs to be answered."	I1, I3, I4	3
Environmental regulations	"Cars and bikes have almost zero restrictions which will allow a lot of businesses to take advantage of Crowd-Shipping will excel in this aspect."	I5	1
Integration of regular operations and Crowd-Shipping	"The only way to go about integrating the two would be to divide the work appropriately. For example, our company uses trucks from the warehouses to sorting centers near the cities. The deliveries within the cities can be divided into Crowd-Shipped deliveries and a few vans."	I1, I3	2
Delivery Pricing	"The main reason customers including consumers and businesses are open to these options are because of price agreements. The flexibility of matching your desired price is something that cannot be negotiated with other companies".	I1, I3, I4	3
Effective ICT Application	"ICT can enable agreements between the customers and companies with respect to accepting a Crowd-Shipped package. The application thus makes it handy by enabling effective communication. The application also will enable live tracking which will provide my customers trustworthiness".	I1, I2, I3, I4	4
Eco-Friendly Logistics	"Eco-friendly and willingness of Crowd-Shipping are positively correlated, especially in countries in Scandinavia and Northern Europe like Belgium and Netherlands."	I1, I2, I3, I4	4
Wage Model	"The wage system will correct itself once Crowd-Shipping is implemented"	I1, I2, I3, I4, I5	5
Reverse logistics	"I guess C2C and C2B would work as well. I am talking about the reverse logistics part. Shipping back packages would be ideal for CS to work in the Netherlands."	I1, I3, I4	3
Flexibility	"Flexibility is an important aspect in this. The bigger logistics companies are not flexible enough for operations in this scale. Crowd-Shipping platforms can offer this flexibility."	I4, I5	2



Table 7: Example Quotes for Barriers

Barrier	Example Interview Quotes	Interviewee Code	Frequency
Supply and Demand of drivers and customers	"Sometimes people appear looking for a delivery task and sometimes there's no one to fulfill existing delivery tasks. The supply and demand can be very fickle"	I2, I4	2
Regulations	"Every law begins once an operation starts. Regulatory authorities catch up with innovations."	I4, I5	2
Data privacy	"Therefore, trusted brings again becomes crucial to maintain this trust and privacy. However, there can be no assurance in any business in the shared economy. "	I1, I2, I3, I4, I5	5
Customer Willingness	"We are not that trusting of other people and we are not willing to do something for someone else."	I1, I2, I3, I4	4
Package Handling	"Companies implementing Crowd-Shipping need to be wary of the drivers handling food items and alcohol while delivering as these items are heavily regulated"	I1, I3, I5	3
Traffic Laws	"People may begin parking at all places if Crowd-Shipping happens. They already do in the case of Uber Eats, ThuisBezorgd. We need to add stricter parking rules in the future to curb this".	I1, I5	2
Trusted Occasional Drivers	"B2B transactions demand full trust and compliance as these transactions may sometimes amount to large money. We need to make sure that our drivers are trusted and the supply is there. If not, we do the tasks ourselves."	I1, I4	2
Operating Costs	"Our employees who drive also perform several other tasks such as warehouse work, loading, unloading and sorting. We will have to invest more money in occasional drivers than regular drivers because occasional drivers will not offer us anything more."	I1, I3	2
Built environment	"The real estate barrier may also serve as an opportunity to companies, but it is indeed a barrier to accommodate a smooth functioning by bringing in the right investments".	I1, I5	2
Image of the company	"Usually people see our vans and trucks and know their parcels are safe and sound but when they see a vehicle which is blank, without any labels, they may not completely trust the service or safety provided."	I2, I3, I5	3
Social Security	"Companies have the duty of taking care of their employees. In the case of Crowd-Shipping, companies may have to carefully deduce a plan for existing employees and their existing benefits to not be affected by Crowd-Shippers."	I2, I3, I5	3
Integration of regular operations and Crowd-Shipping	"There's a lot of other work performed by our personnel and this will get affected by bringing in Crowd-Shipping if not integrated in a certain way."	I1, I3	2
Delivery Pricing	"How can you value someone's time?"	I1, I3, I4	3
Effective ICT Application	"ICT has the potential to solve the trust problem but in my experience, drivers may not like to be tracked due to privacy concerns. "	I1, I2, I3, I4	4
Eco-Friendly Logistics	"Are we actually going to save the environment with this concept?"	I1, I2, I3, I4	4
Wage Model	"The working hours load on some of our employees during peak pandemic was unfortunate. It led to exploitation to a great extent and we acknowledge the amount of work they put in during these tough times."	I1, I2, I3, I4, I5	5
Reverse logistics	"Reverse logistics is an issue that does not get enough attention"	I1, I3, I4	3
Flexibility	"Sometimes early delivery is not always the best, people usually demand quick and time efficient deliveries but that poses a challenge of finding drivers suitable for their requested time frame"	I4, I5	2

## 4.5 Refined Guiding Framework

A refined Guiding Framework is derived through which we can see some of the drivers and barriers that have been validated or contradicted through the findings of the research (Figure 11). A set of new drivers and barriers were also found through the content analysis and quantitative analysis. The changes from the initial framework (Figure 2) are highlighted with a white background to easily identify the differences with the initial framework.

With respect to the crowd, additional income, flexibility, low delivery charges, contributing to the environment, previous experience as a delivery executive and socio-demographic factors were found to be drivers through the literature review and validated through the content analysis. The availability of occasional drivers' details, insurance provisions, the size of the company and occasional drivers' reviews are found to be additional factors that can drive or motivate customers and occasional drivers to use Crowd-Shipping services. The barriers found in the literature review for the crowd consisted of data privacy, trust, safety, reverse logistics, travel time and detour (for occasional drivers). The results indicate that geographical setting of the delivery, weight and size of the package, value of the package and the number of packages that need to be delivered are also seen as challenges or barriers for the crowd.

For logistics companies, the drivers to deploy Crowd-Shipping services are ICT, high delivery volumes in urban areas, integrating Crowd-Shipping with their existing services, growth in e-commerce, expanding their scale or operations and promoting eco-friendly logistics. Providing more flexibility, bypassing environmental laws in the Netherlands and pricing their deliveries competitively are also found to be drivers for companies, through the results. However, there are also new additions to the list of barriers or challenges for these companies. Providing social security to employees or occasional drivers, protecting the image or reputation of the company, higher operating costs, real estate, the uncertainty of eco-friendliness, flexibility and integrating their regular operations with Crowd-Shipping are found to be barriers, although some of these were indicated to be drivers through the literature review.

From a regulatory or legislative perspective, traffic regulations and social security add to the list of barriers or challenges. Data privacy however is found not to be a barrier for the regulatory authorities in the Netherlands. For the business model innovation perspective, two approaches were found. One approach was for start-ups, who have incorporated Crowd-Shipping but also want to deploy it in the Netherlands. The second approach was found to be for big logistics companies, who may want to incorporate Crowd-Shipping services in the future.

These findings will be discussed in detail with more insight and analysis along with backing from the literature review or new literature backing the findings in the discussion section.

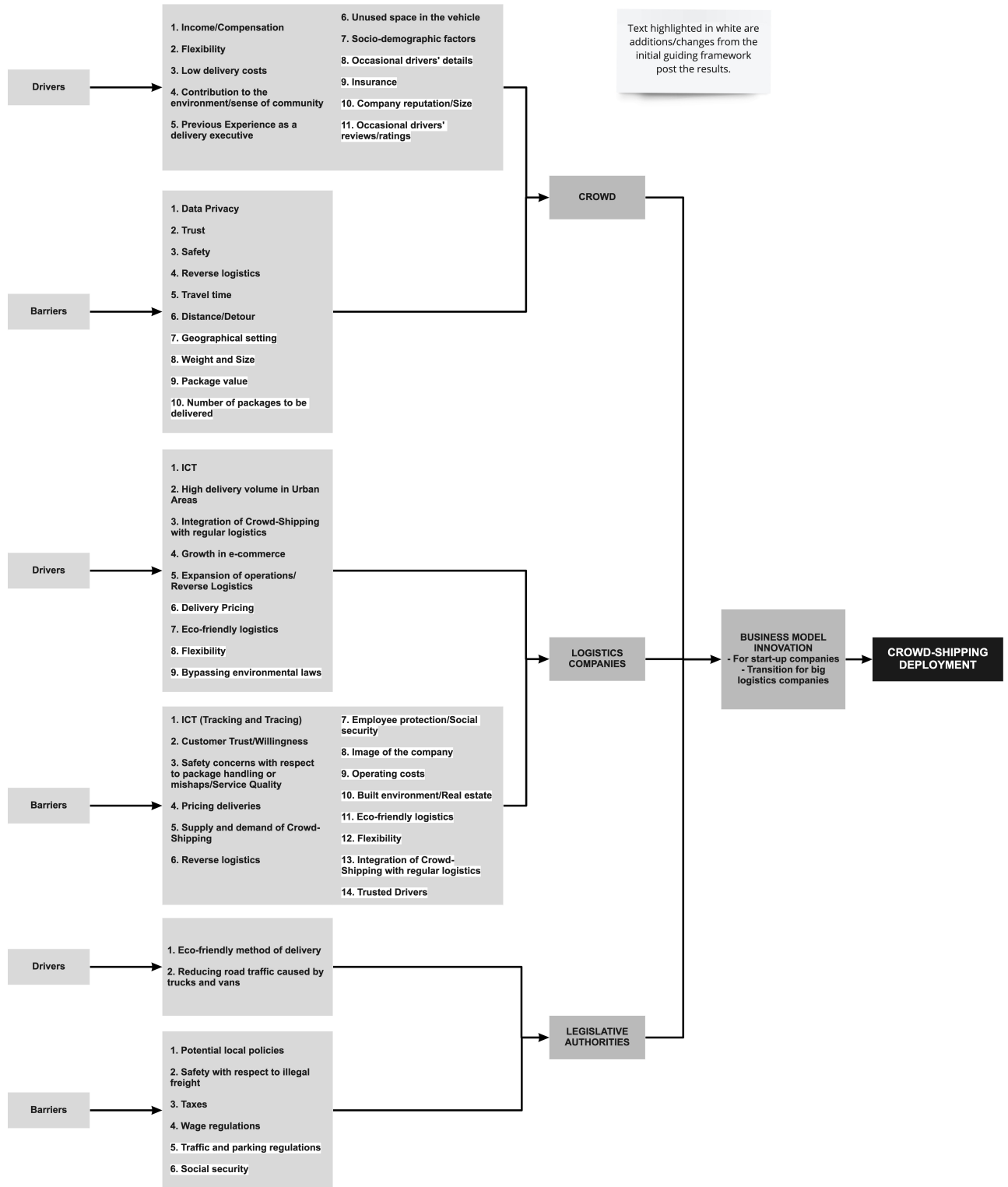


Figure 11: Refined Guiding Framework

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## 5 Discussions and Limitations

The chapter will discuss our main findings with respect to the research objective and address the sub-research questions. The main objective of this research was to find how Crowd-Shipping can be deployed in the Netherlands through a series of sub-questions that focus on what the drivers are, what the barriers are and finally the business model changes that are required for a company to enable Crowd-Shipping services. The chapter will be divided into two sections: the first section will address the sub research questions relating to drivers and barriers of Crowd-Shipping while the second section will address the business model innovation aspect of Crowd-Shipping.

### 5.1 Drivers and Barriers of Crowd-Shipping

To summarise the findings from the content analysis, the first driver that was found for Crowd-Shipping implementation was the growth in e-commerce activities across the Netherlands (third highest in Europe (Coppola, 2021)) and also the world, which is in line with existing literature. The rise in e-commerce retail share globally increased 3% and is expected to rise by a larger percentage this year and in the future (UNCTAD, 2021). From the survey conducted for customers, about 69.2% of the respondents use e-commerce platforms more than once a month to shop and 61.5% of the respondents spend more than 20 euros on average while shopping.

The next driver that was explored through the content analysis was how companies can integrate Crowd-Shipping services with their existing delivery services. The findings indicate that the integration will not be smooth for the big logistics companies, which may have to change their structure or invest large sums of money in doing so. Start-ups on the other hand may not struggle with the integration, especially when their sole focus is Crowd-Shipping services. However, one way of integrating the two for big companies would be to divide the delivery tasks in the sense that the traditional services would continue up to the last-mile segment. For the last-mile segment, Crowd-Shipping can be introduced via e-bikes or bicycles especially within cities or towns with large delivery volumes. This point is also in line with existing literature about how companies can potentially eliminate or decrease truck and van trips (Le et al., 2021) (McKinnon, 2016).

Another important finding with respect to integration is how big logistics companies need to incorporate the deliveries of non-standardised items i.e. items that do not require extensive packaging and therefore increasing space capacities for vans and trucks operating. Although the integration of the two services in the literature review is indicated as a driver (Simoni, Marcucci, Gatta, & Claudel, 2019), the finding is also in line with the existing literature about how the importance, consequences and potential of integrating Crowd-Shipping with traditional services need to be studied (Guo et al., 2019).

Pricing is one of the most important factors with respect to Crowd-Shipping services (Pourrahmani & Jaller, 2021). Some of the existing research has focused on how pricing can be evaluated or estimated for providing Crowd-Shipping services. Propositions such as bidding and subscription-based pricing have been studied upon along with integrating pricing with matching and routing (Le et

al., 2021). The experts expressed that it is difficult to value an occasional drivers' time and also the distance covered as sometimes the tasks may encounter multiple detours. Through the survey findings, potential occasional drivers also consider the time taken and magnitude of a detour as influencing factors in Crowd-Shipping participation. Also, for occasional drivers who agree to deliver multiple packages around a smaller geographical area, paying drivers for each task will increase costs for companies. Rather companies can price deliveries dynamically depending on the number of packages, distance covered, time consumed and potentially a subscription-based system that companies may have to work on.

The results from the survey conducted for customers also indicate that delivery charges in comparison with traditional services would drive them to accept Crowd-Shipping services, which is also in line with existing literature about delivery charges (Simoni et al., 2019). Companies will have to take this factor into consideration as well, therefore making pricing mechanisms a trade-off between acquiring high-profit margins, providing cheap deliveries for customers, and ensuring adequate compensation for occasional drivers. This trade-off will prove to be a challenge/barrier for big logistics companies as well as start-up companies.

Wages for occasional drivers will be determined by pricing strategies framed by companies. Wages for occasional drivers require a model or a system from companies who need to or want to implement Crowd-Shipping (Joerss et al., 2016). Wages could be a challenge for start-up companies, especially due to the fact that some occasional drivers may begin to consider Crowd-Shipping as a full-time job. Also, if occasional drivers receive multiple requests around a small geographical area, it would be expensive for the start-up to pay the occasional driver a fee for each delivery. The Netherlands has a minimum wage system for all age groups over 15 years and companies employing people need to adhere to these regulations (van Sociale Zaken en Werkgelegenheid, 2021). However, occasional drivers do not fall under the category of employees. In extreme situations of multiple deliveries for a single occasional driver, companies may need to be considerate and avoid exploiting the willingness of an occasional driver. Crowd-Shipping also faces a social security barrier. Social security in the Netherlands can be considered amongst the most supporting across the world with various provisions for people challenged with financial circumstances (Zorgverzekering, 2015). Social security can affect Crowd-Shipping in two ways: Firstly, companies need to ensure their existing employees are protected and their contracts are not threatened by occasional drivers. Secondly, companies may also have to ensure occasional drivers are protected with some provisions. In companies such as ThuisBezorgd or UberEats, employees face fluctuations in income which may hinder their livelihood (Rozsa, 2020), which was also indicated in the interviews. The findings also provide the investigation on wage implications as recommended for further research by Gatta et al. (2019).

The supply and demand of occasional drivers are found to be uncertain due to the nature of the concept (Le, Stathopoulos, Van Woensel, & Ukkusuri, 2019). An adequate mass of occasional drivers will be required for Crowd-Shipping to smoothly function (Rougès & Montreuil, 2014), which applies to both start-up companies and big logistics companies. With the current systems implemented in different countries, occasional drivers are offered a few choices to accept a package delivery or decline the delivery. When a company relies on these occasional drivers, it will have to

face this uncertainty until the concept grows and cements itself as a trustworthy system. Companies and businesses work on orders which they expect through a series of demand and forecasting. Time windows are extremely narrow for companies to execute deliveries and due to their forecast and planning, the process runs smoothly with occasional hindrances. With the implementation of Crowd-Shipping, companies may have to keep backup options open in the worst-case scenario of occasional drivers not willing to participate as mentioned by I4. The supply and demand for Crowd-Shipping in the Netherlands can be researched further in-depth to provide companies or stakeholders a better viewpoint. However, in this research, we do address what drives occasional drivers and customers to participate in Crowd-Shipping.

In the case of Crowd-Shipping, the service with respect to the direction of flow is an important aspect that needs to be taken into account. As mentioned, existing research focuses more on the B2C aspect of Crowd-Shipping services. However, crowd-Shipping is a flexible concept that can be marketed as a B2B, B2C and C2C (Frehe et al., 2017). Expansion of operations for logistics companies is found to be a driver from the literature review as companies need innovative ways to ensure the demand meets supply. The findings indicate that along with B2B, B2C and C2C services, a C2B service can be provided by companies for the return of goods and packages through Crowd-Shipping. The return of packages in the Netherlands currently requires customers to go back to pick-up points or the retail outlets which can be time-consuming. A C2B service through Crowd-Shipping will give customers the flexibility to return packages at their convenience in terms of time and mobility. Although similar to Chen et al.'s (2016) proposed taxi driver model, this aspect has not been discussed in the existing literature and is an interesting option for companies to explore and therefore expand. Another benefit of using Crowd-Shipping for C2B services will be the bypassing of the already burdened warehouses, sorting centres and pick-up points. This may reduce costs for the logistics companies as well as businesses tied up with the logistics companies.

Also, reverse logistics is indicated in the literature review and the start-up investigated as a barrier or challenge to Crowd-Shipping implementation. The findings indicate that reverse logistics can indeed become an opportunity or a driver to implement Crowd-Shipping services. Concerning delivery flexibility, through the literature review as well as the content analysis, it may be inferred to as one of the most crucial drivers for companies and customers to implement and accept Crowd-Shipping respectively. Customers willingness based on the flexibility offered received the highest mean value in the survey and all logistical experts pointed out the fact that flexibility is one of the key value propositions for companies willing to sell Crowd-Shipping. There may be hindrances in offering flexibility due to the supply and demand of occasional drivers as well as customer availability (especially for start-ups who may not have dropped off points). However, existing literature and findings from the research can validate flexibility as a key driver to implement Crowd-Shipping. In the Netherlands, working people are usually away from home during peak hours, which flexibility as a driver, can solve for them.

Research concerning Crowd-Shipping indicates how the concept can be environmentally friendly in comparison with the traditional services. Several studies such as Punel (2018) and Bellotti et al. (2015) suggest that environmental friendliness could be a benefit of Crowd-Shipping implementation and drive customers to accept it, while Le & Ukkusuri (2019) suggest that this aspect needs

more research. The findings in our research consider eco-friendliness a selling point, especially in the Netherlands where the affinity towards eco-friendliness is high. The responses from surveys for customers and occasional drivers indicate relatively high mean values and positive correlations for a sense of community factors (reducing carbon emissions and helping people with income). However, experts also indicate that Crowd-Shipping may not actually be eco-friendly, especially in situations of occasional drivers carrying only one package and the intended delivery location has multiple requests, it becomes impractical and expensive to hire multiple occasional drivers for multiple deliveries in the same location or around the same location. The number of packages to be delivered also affects occasional drivers' willingness to participate in Crowd-Shipping. This in fact increases the volume of vehicles for the deliveries performed which could have been completed with one delivery van. Also, inter-city or inter-region Crowd-Shipped deliveries will not prove to be feasible if the environmental aspect is considered. Crowd-Shipping may prove to be environmentally friendly mostly in the case of last-mile deliveries provided the use of electric vehicles are more than carbon-emitting vehicles (Simoni et al., 2019), which is also in line with our content analysis findings of acquiring and deploying EV fleet for Crowd-Shipping.

Environmental laws in the Netherlands with respect to delivery vans and trucks not being allowed in city limits at certain times of the day as well as due to weight restrictions can be identified as a driver for Crowd-Shipping implementation. These laws framed by the government in the Netherlands enable strict measures to avoid hassle on the streets especially in urban areas where road traffic is high (Ministerie van Infrastructuur, 2018). Start-ups and big companies can take advantage of this law and enable the deployment of Crowd-Shipping through cars or bikes, which do not have any regulations thus far. Also, the companies can take advantage of the Crowd by enabling deliveries for businesses that continue to sell products beyond peak hours of the day and who do not have logistics capacities. There are also policy goals that the Government of Netherlands is planning to implement which mainly focus on driving lesser, procuring electric vehicles and incentivising the same. The goals also include a full transition of carbon-emitting vehicles to electric vehicles by 2030 which could affect Crowd-Shipping in the sense that people may have to procure new vehicles and also may make Crowd-Shipping a short-term solution in terms of being an eco-friendly delivery method. Parking laws need to be taken into account in case Crowd-Shipping becomes successful which is in line with the literature stating regulations may arise once the service has been deployed (Briffaz & Darvey, 2016).

Information and Communication Technology was found to be a driver (research by Upadhyay (2020)) and a potential barrier through the literature review. However, the barrier aspect of ICT was found to be more oriented towards people not having access to the internet (Paloheimo et al., 2016), which will not apply to the Netherlands. ICT has changed the way the world does business and the dependency of e-commerce on ICT applications is extremely large. Along with the operations efficiency ICT offers, the provisions with respect to factors such as payments, routing, visibility and other aspects makes ICT and e-commerce inseparable elements (Kumar, Arif, & Malik, 2014). Through the findings, we can observe that ICT mostly can be classified as a driver of Crowd-Shipping implementation due to the fact that it can enable smooth matching, route optimisation and pricing mechanisms, provide details of the occasional driver, a communication platform, privacy and permission related agreements for customers and occasional drivers, reviews

and ratings, and also provisions such as delivery time windows or tracking and tracing. From the surveys conducted, it is indicated that providing these details received relatively high mean values for customer willingness, indicating them as drivers and therefore proving the importance of ICT from the customer perspective.

Policy implications on ICT and new technologies are fundamentally changing over time (Janssen & Helbig, 2018) and this will be addressed by policymakers once the Crowd-Shipping concept has been implemented. Also, data privacy is a barrier found through literature (Najafabadi, 2019) and validated through the survey for customers. Tracking and tracing however is indicated in literature and interviews as a potential barrier for occasional drivers who may feel their privacy is threatened. The survey for occasional drivers partially contradicts the opinion of the logistical experts regarding tracking and tracing. Therefore the overall perspective of ICT being a driver with all mentioned provisions may hold valid as per our results. To eliminate occasional drivers being tracked, the modular packaging system can be brought in by companies, where the package has an in-built system that can be tracked (Chen et al., 2017). The provision of insurance for the package may prove to be the biggest driver for Crowd-Shipping from a customer perspective. Shipping insurance has become a growing trend since the onset of the pandemic (Karapetkov, 2020). Logistics companies can also take advantage of this provision by charging a small insurance fee to ensure customers trust the service and therefore use it in order to help meet delivery demands. In fact, insurance had relatively high mean values and positive correlations with other drivers for customer willingness and occasional driver willingness. It also adds value for occasional drivers who may be wary of package safety due to inexperience and possible wrong-doing or safety concerns (accidents).

The built environment and real estate is another challenge that can be faced by companies willing to implement Crowd-Shipping. This point should not be confused with Ermagun et. al (2019) where the built environment aspect mentions more about urban and rural areas affected the demand of Crowd-Shipping. In order for Crowd-Shipping to take place within cities and towns, warehouses or sorting centres need to be located close enough to ensure occasional drivers do not have to travel large distances to collect packages and then deliver them to customers. The results from the survey for occasional drivers indicate the magnitude of the importance of distance/detour and geographical setting of the deliveries. Companies will have to invest more in developing warehouses and sorting centres close to areas of high demand in the Netherlands.

However, this is not the only form of investment that companies have to make. The operating costs due to crowd-shipping will be higher than it currently is with traditional services. This contradicts existing research which indicates that Crowd-Shipping may reduce operating costs of companies (Arslan et al., 2019) (Rougès & Montreuil, 2014). As mentioned, experts indicate that companies will invest more in transportation (EVs) and human resources while also compromising on profits to a large extent. The employees belonging to these companies perform several tasks other than deliveries for which they are paid through an hourly wage along with some incentives for deliveries. However, start-ups may not incur heavy operating costs in comparison with big companies due to their reliance on matching mechanisms rather than using their own resources.

Company reputation or 'Image' as the experts called it is potentially the biggest barriers com-



panies may face while implementing Crowd-Shipping. Experts indicate that the companies are extremely possessive about their image to an extent of copyrighting their logos and the colour used. The big companies base their customer relationships with elements of loyalty, reputation and excellence (DHL, 2015). These companies risk losing their reputation while trying to implement Crowd-Shipping as Crowd-Shippers will not drive around with the same van or vehicle displaying the logo or any intangible asset of these companies. This in turn will reduce the level of trust that customers have over these companies. In terms of customer and occasional driver willingness, the reputation of the company and willingness based on the size of the company received relatively high mean values indicating the extent of trust people have in the big companies. Companies will need to ensure that this trust needs to be maintained with the same quality of service even if Crowd-Shipping is implemented.

Some of the other drivers and barriers affecting Crowd-Shipping implementation such as weight and size of the package, the value of the package, and previous delivery experience also affect the willingness of occasional drivers. In the case of large packages such as electronics or furniture, this barrier comes into play possibly influencing occasional drivers to decline some of the tasks. Package value is an important aspect for customers to choose between Crowd-Shipping and traditional services. Most customers would be willing to receive items such as clothes, household items and books, in comparison with more expensive items such as electronics and jewellery. Occasional drivers having previous experience also matters to a larger section of the customers who responded and can therefore drive them to accept Crowd-Shipped packages. This is also in line with existing research where previous experience in freight transportation enables the more occasional driver and customer willingness (Le & Ukkusuri, 2018).

We can also identify relationships between the factors (drivers or barriers) through the correlation analysis conducted. From the customer's survey, we find that two metrics for a sense of community, contributing to the environment by using Crowd-Shipping and helping people find sources of income, have amongst the highest correlations achieved. Also, being eco-friendly and using Crowd-Shipping for eco-friendly reasons show a positive relationship, albeit a weak correlation. However, this is in line with the literature review regarding how a sense of community motivates or drives customers to use Crowd-Shipping services (Punel, Ermagun, & Stathopoulos, 2018b). Safety concerns which is a barrier for the customers (Marcucci et al., 2017) also has a high positive correlation with insurance availability, which indicates that insurance if provided can address the safety concerns for customers when Crowd-Shipping is implemented. Also, with more delivery experience, privacy concerns show a positive correlation, possibly indicating that delivery experience drives customers more into trusting occasional drivers. Cheaper delivery charges and flexibility are two key propositions of Crowd-Shipping and the positive correlation between the two show customers' willingness is driven by these aspects. Customers may also prefer big companies vs start-ups in Crowd-Shipping services as there is a positive correlation between this and the delivery experience of the occasional drivers', which may be something companies will consider while deploying Crowd-Shipping services.

From the occasional drivers perspective, the magnitude of the detour is negatively correlated with eco-friendliness, which shows they are concerned about the environment do not consider

willingness based on a detour to a large extent. However, detour and time taken to deliver packages are positively correlated with a relatively high magnitude which is in line with literature about how time tolerance affects occasional drivers' willingness while participating in Crowd-Shipping services (Le & Ukkusuri, 2018). Having a sense of community and working as an occasional driver also is in line with the literature as mentioned also for customers (Marcucci et al., 2017) (Bellotti et al., 2015) (Simoni et al., 2019). Weight and size of the packages and number of packages also matter to occasional drivers, especially if they travel in bikes and this is indicated through the positive correlation between the time taken, the magnitude of deviation, geographical setting of the delivery, and insurance provided for the package with weight and size of the packages and number of packages to be delivered. Receiving income or compensation is a big driver for occasional drivers to participate in Crowd-Shipping and the correlation between income and time taken to perform the deliveries and also company reputations show occasional drivers want to earn more based on these two factors.

## 5.2 Business Model Innovation

Two ways of business model innovation can be discussed based on the findings. The first is a start-up perspective, where the start-up can behave as a platform-based (ICT), third-party stakeholder performing various tasks such as customer-occasional driver-business matching. In literature, the concept of shared economy platforms is not new. Shared economy platforms consist of several start-ups, some of them which have now established into large companies such as Uber and Airbnb. However, research on the relationship between these businesses and their advantages such as sustainability based on optimising underused spaces is scarce. Since these businesses are sold as sustainable and address deficiencies in current public and private stakeholder infrastructure, it is important to study the business models and understand what they bring to the society (Cohen & Kietzmann, 2014). Also, shared economy platforms always run into conflicts with institutions and regulatory authorities due to their challenging nature and this potentially limits their positive impacts on the society (Cohen & Kietzmann, 2014). The results from this research follow a similar structure to what is found in the existing literature regarding Crowd-Shipping start-ups and also shared economy platforms with respect to business models.

Through the interview with the start-up logistics expert, there are a set of key findings that can be explained through the elements of a business model canvas, on what start-ups focus on or need to focus on to implement Crowd-Shipping. To begin with, the key partners of the start-up company was spoken about through which we understand that investors, businesses and trusted occasional drivers are the company's partners. Investments in start-ups by VCs or investors are found to have a positive impact on the growth of the company (Jeong, Kim, Son, & Nam, 2020). In a study conducted by deloitte, it was found that worldwide investments in shared economy platforms reached an amount of \$12B in 2015, which was almost three-folds of investments in big-tech companies like facebook and twitter (Andreotti, Anselmi, Eichhorn, Hoffmann, & Micheli, 2017). In literature, the key partners for start-up companies deploying Crowd-Shipping focus more on commuters/travellers, professional and non professional couriers (Rougès & Montreuil, 2014). However, in our findings, the importance for Crowd-Shipping start-ups to bring in investments

to ensure a linear growth curve as well as acquire important resources at the beginning of the innovation, is indicated. The start-up we investigated uses the key partners element of the business model canvas as one of the spaces to bring in business model innovation.

The key activities of a Crowd-Shipping start-up consists of mainly the delivery tasks, occasional driver-customer matching and providing a platform with a pre-determined price or a negotiable price between customers and occasional drivers. This is in line with existing research by Rouges & Montreuil (2014). The importance of pricing has been discussed in detail in the above sections. The aspect of negotiation becomes important in a C2C transaction and may be beneficial for both parties or may make the matching process more time consuming. Therefore, there is a trade-off for platforms while deciding if a price has to be given prior to the delivery or customers can have the luxury of negotiating. In the case of the start-up investigated, customers and occasional drivers are free to negotiate prices for C2C transactions.

Resources required for start-ups consist of ICT mainly, due to the dependency of the company on a clear and effective ICT as discussed earlier. ICT platforms also boost innovative models in terms of values and our revolutionary as well as cost-effective (Ruggieri, Savastano, Scalingi, Bala, & D'Ascenzo, 2018). Another use of ICT platforms is design innovation, an aspect that has been used by other shared economy platforms such as Uber (Tamberino, n.d.). Also, the use of ICT in the start-up investigated is identified to be high in technology, which is not always the case with other start-up companies as mentioned in literature (Rougès & Montreuil, 2014). Traditional delivery systems require customers to go to pick-up points or courier centers and drop packages off. The ICT interface of Crowd-Shipping platforms enable customers to upload a package where occasional drivers can pick it up and deliver it to an intended destination, along with providing other features such as communication, payment portals and tracking. This proposition through the ICT application eliminates a lot of manual work required by users/consumers, which is how the start-up uses design of the service and application as innovation. Other key resources include financial resources that are driven by investments and revenue, and most importantly human resources who have the expertise while also participating as occasional drivers. If marketing costs are added to the above resources, the cost structure element of the start-up business model becomes complete along with other variable costs that may be involved.

Creating value propositions are key to create products and services that customers want or need (Osterwalder, Pigneur, Bernarda, & Smith, 2014). Fitting the customer profiles with the value map, which is how companies create values is a key function to achieve while selling a product or a service (Osterwalder et al., 2014). It is essential companies create a blend of social and financial returns through the value propositions although this blend may consist of several trade-offs. This blend also pushes for continuous change and innovation and putting this in reality is a difficult task which may not be captured through a business model canvas (Emerson, 2003). Based on character (values), Rouges & Montreuil (2014) suggest that efficiency, control, human touch and trust stand out for the start-ups investigated in their research. However, the value propositions for the start-up investigated include cheaper delivery charges, greener logistics and flexibility with respect to choosing date and time. The start-up we investigate can be seen to innovate in the value proposition element of the business model canvas. Customers want cheap deliveries and as seen

through the results, have a sense of community with respect to the environment, therefore making these value propositions in-line with the existing literature about how value propositions needed to be created and blended with societal and financial benefits. The sustainable or green logistics aspect plays a huge role in most shared economy platforms (Andreotti et al., 2017). Also, income generation is a value proposition for shared economy platforms which also is applicable in the case of Crowd-Shipping for occasional drivers.

From the investor perspective, the company can sell as a platform based tech company, which in today's world has credibility due to worldwide access and therefore ensures trust and timely returns of investments. In the start-up investigated, insurance is a huge value proposition which the expert believes provides customers an element of trust and security while using the services. This is in-line with what other start-up companies provide as a value proposition for Crowd-Shipping services (Everard, 2018). However, not all companies include insurance in their services which could prove to be a disadvantage for customers. Also, as mentioned by the expert from the start-up company, customer relationships are built on providing better/equal service in comparison with other logistical companies as well as providing safety and on-time delivery efficiency. Like all other shared economy platforms, user experience will enhance after a few times of usage and customer loyalty will develop with time. The final element of the business model canvas for start-ups consists of the revenue streams which in this case consists of delivery charges, service charges, insurance charges. Some start-ups across the world include subscription charges which provide consumers discounted prices depending on the usage. The business model canvas for the start-up perspective is shown in Figure 12.

In Figure 12, the arrows direct to notes which indicates how the start-up investigated can use the business model canvas for business model innovation. As mentioned earlier, the start-up portrays itself differently to different stakeholders. To customers, the start-up is a third party platform aiming to provide greener logistics. However, the start-up requires tying up with investors and businesses to bring in capital, portraying as a tech company. Janes (2018) emphasises on the importance of platform based companies for the modern economy and especially for investors. Bringing in the right investments enable start-up companies to establish themselves in new markets. As mentioned by the logistics professional from the start-up, investors are attracted to tech/IT companies due to the growth and accessibility of IT across the world. Also, tying up with businesses will be beneficial for start-ups to broaden their reach and credibility. It will also enable them in not entirely depending on customer-occasional driver matching, but also have a fixed inflow of orders and revenue. It is also important to notice that the Crowd, mainly occasional drivers are part of the key partners and not key resources, since the occasional drivers are not employees. This will enable them to avoid taxes and other implications if the occasional drivers were employed, unlike big logistics companies who have several employed personnel for deliveries. The discussion also mentions the design innovation aspect, which is crucial for third-party platform providing start-ups. Easing or automating manual processes within the application has proven to be attractive (like Uber) and this enables the start-up to innovate through the value proposition element as well as channels element of the business model canvas.

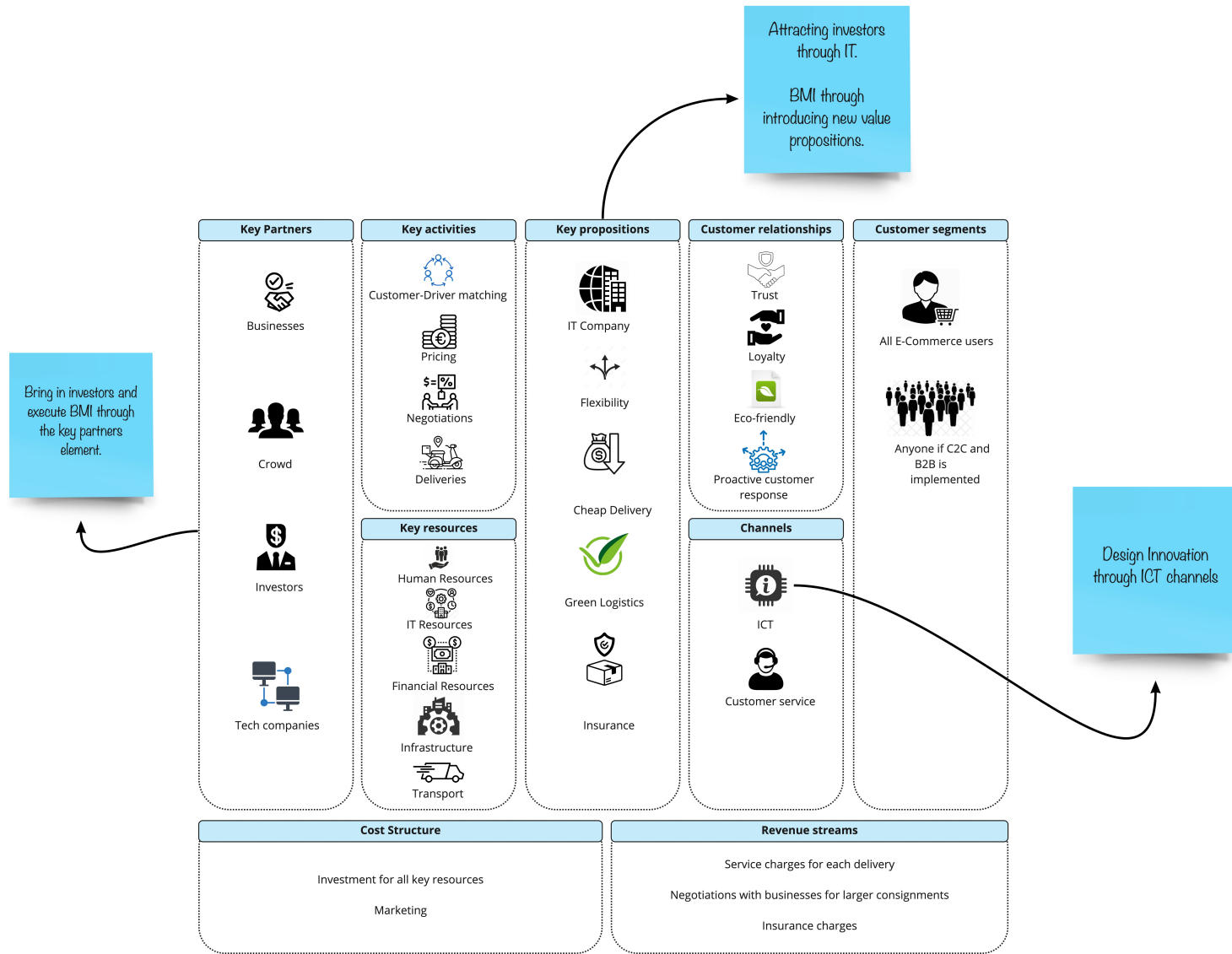


Figure 12: Business Model Innovation (BMI) for Start-Ups, Own illustration based on findings (Business Model Canvas is based on Osterwalder (2005))

The second way of implementing Crowd-Shipping is through an existing logistics company or logistical service provider. These companies may have to adjust their structures with respect to operations as well as selling themselves to the customers. Literature on business models is extensive with respect to designing or developing new ones but nascent when it comes to how companies can transition from an existing business model to a new or desired business model (De Reuver, Bouwman, & Haaker, 2013). Also, in the current era of e-commerce, businesses need to constantly reinvent their way of functioning through business models (Bouwman, de Vos, & Haaker, 2008). Technological and market dynamics become the most important drivers for business model transition for small companies. However, for large companies, technological and market dynamics have moderate effects on business models (De Reuver, Bouwman, & MacInnes, 2009).

The current business models of these companies have enabled them in creating huge global and local market shares, and the findings from the content analysis suggest that none of these companies are willing to make the first move in implementing Crowd-Shipping. There seems to be an element of scepticism with respect to incorporating the concept into the existing models of the company. This could also be due to the fact that the experts believe Netherlands has an extremely efficient logistical infrastructure and a small geographical area in comparison with other countries in the world (TopDutch, 2021). They also believe that to implement Crowd-Shipping, they need to consider the challenges or barriers that are mentioned above and the findings indicate that the cons weigh more than the pros for big logistics companies, as also indicated by the expert from the start-up.

In the e-commerce sector, first movers usually have the disadvantage of being subject to sudden jolts due to lack of policies, new technologies which may lead to an eradication of competence and revenues (Mellahi & Johnson, 2000). Also, e-commerce sectors are extremely fickle with respect to innovations and competitive advantages and this makes companies prone to having new ways of innovating, speed of implementing and securing their services through patenting (Mellahi & Johnson, 2000). This is also in-line with how Crowd-Shipping can erode into the profits of big companies as mentioned by the experts and in-line with the existing literature regarding how DHL's MyWays pilot program did not work out despite being a first mover in Crowd-Shipping for a European country (DHL, 2013).

Another takeaway from the findings is to what extent businesses would be willing to send their packages with companies if Crowd-Shipping is implemented. There is more at stake for big companies to negotiate the concept with businesses and customers than for the start-ups. However, if big companies do want to look into the prospect of bringing in Crowd-Shipping, they can focus on greener logistics, cheaper delivery and flexibility as the main value propositions along with providing a solid ICT platform to enable effective communication for customers. Divisions of tasks between traditional services and using Crowd-Shipping purely for last-mile logistics is crucial in pushing for the green logistics proposition as well as ensuring existing employees have their current tasks in hand. Companies can also enable a direct delivery system if negotiated well between businesses and customers where packages can bypass warehouses and sorting centres, especially if these businesses move their products through retail outlets in cities or towns.

To elaborate on the business model transition in a clear and simple way, we can categorise four domains where big companies may need to change their business model elements. The first domain is the service domain, consisting of the value proposition and the target group. This domain for big companies will incorporate greener logistics, flexibility, insurance, non-standardised item deliveries and cheaper deliveries charges along with targeting frequent e-commerce shoppers possibly with subscription models for discounted deliveries. To incorporate greener logistics, companies can invest in sustainable transportation such as EVs, which they can lease or rent to occasional drivers. This way, companies can add an element of circularity in the business model through retaining product/asset ownership which is a key strategy for circular business models (Atasu, 2021), and enhancing product life extension which in this case would be to extend the Crowd-Shipping services even when all acquired fleet becomes sustainable.

The next domain would be the technology domain, which would include the new ICT infrastructure as well as network structure through the ICT for pricing, matching, routing and effective communication. The organisation domain will include how traditional logistics and Crowd-Shipping services can be given specific roles, for example, Crowd-Shipping can be allocated for last-mile deliveries using EVs in urban areas and until the last-mile, traditional logistics can be utilised. The last domain to be considered is the finance domain, where the revenue model for the new business model can be reinvented. However, this is the tricky part for logistics companies due to their views on how Crowd-Shipping may increase costs for them rather than creating more revenue. The above are shown through the business model canvas in Figure 13. The business model canvas shown in Figure 13 is a dynamic business model which shows changes over time (if and when Crowd-Shipping is implemented) as companies need to keep adopting their business models due to internal and external factors, which in this case will be influenced by Crowd-Shipping implementation. The canvas shows the elements which require change from existing business models through the different colour codes used. However, this canvas may fail to show interrelationships between the elements of the business canvas, which is a drawback of the business model canvas with respect to showing dynamics (Khodaei & Ortt, 2019).

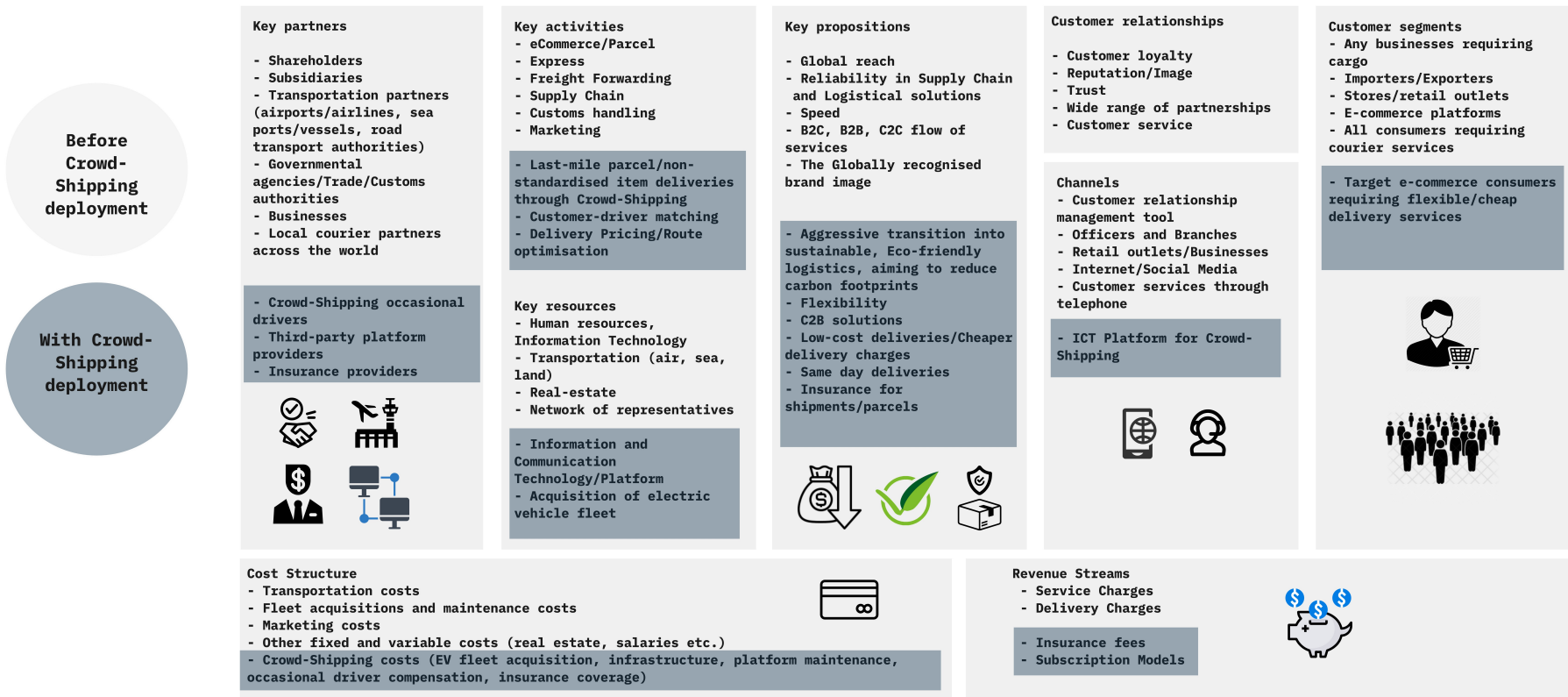


Figure 13: Business Model Transition for Big Logistics Companies, Own illustration based on findings (Business Model Canvas is based on Osterwalder (2005))



The discussion chapter addressed the sub-research questions formulated for the thesis. Through the above discussions based on the findings of the research, we will answer the main research question in the conclusion chapter.

### 5.3 Theoretical Implications

This research contributes to the existing research in several ways. As mentioned in the introduction and research objective, the aim of the study was to explore how Crowd-Shipping can be deployed or implemented in the Netherlands through addressing a set of drivers, barriers and developing a business model, which may need innovation or modifications.

Most of the existing research focuses on the crowd perspective. Also, there were a number of factors that were explored in existing literature that influences Crowd-Shipping implementation in other countries across the world. Drivers of Crowd-Shipping implementation found through the literature such as massive growth of e-commerce (Coppola, 2021), integrating Crowd-Shipping with existing delivery services (McKinnon, 2016), cheaper delivery charges motivating customers (Simoni et al., 2019), flexibility (Punel & Stathopoulos, 2017), sense of community (Bellotti et al., 2015), the use of ICT (Upadhyay et al., 2020), additional income/compensation (Arslan et al., 2019), occasional drivers experience (Le, Stathopoulos, Van Woensel, & Ukkusuri, 2019), eco-friendliness (Arslan et al., 2019), and expansion of operations for companies (Frehe et al., 2017) are validated through the findings of this research. However, some of these drivers like eco-friendliness, ICT, flexibility, and integration of Crowd-Shipping and existing deliveries may also serve as challenges for the deployment, as found through the content analysis and surveys. This research opens up to new drivers that have not been addressed previously such as bypassing environmental laws, insurance provisions, and reverse logistics which was addressed as a potential barrier through the literature review.

As for the barriers, safety (Rougès & Montreuil, 2014), trust (Punel & Stathopoulos, 2017), privacy for customers, travel time, detour, reverse logistics (Pan et al., 2015), illegal freight (Kafle et al., 2017), potential local policies (Briffaz & Darvey, 2016), and supply & demand of Crowd-Shipping (Le, Stathopoulos, Van Woensel, & Ukkusuri, 2019) were validated from the findings, while adding new barriers such as social security, traffic laws, increase in operating costs (which was a driver), and image or reputation of the company.

Another important contribution of the research is not only addressing the factors and exploring new factors, but also addressing the factors for all stakeholders involved in the Crowd-Shipping deployment. As mentioned earlier, existing research focused more on customers and occasional drivers. We focused on the logistics companies and legislative authorities, who play a key role in the implementation of Crowd-Shipping. Also, focusing on how start-ups or big logistics companies may have to develop their business models provides a new and interesting perspective to the Crowd-Shipping concept. A broad perspective of Crowd-Shipping including stakeholder views, and business model innovation aspect has been offered through this research.

A set of relationships have also been discovered with regard to the factors that influence cus-

tomers and occasional drivers. These relationships can be researched upon further to determine the magnitude of their influences and provide more depth to the literature on Crowd-Shipping. Also, factors such as eco-friendly, integration of Crowd-Shipping with regular logistical operations, and economic/financial impacts on companies need to be studied further in-depth, due to the uncertainty of the impact of these factors. The practical implications of the research will be discussed in the following section.

## 5.4 Practical Implications

The practical implications of this research are crucial if companies in the Netherlands are looking at Crowd-Shipping as a potential service. It allows companies to study the challenges and opportunities that they have and possibly address them in suitable ways in order to implement Crowd-Shipping services. The results from the interviews provide practical insight from the eyes of logistical experts and one legislative expert, who have gathered several years of valuable experience and know the potential implications of introducing Crowd-Shipping in reality. Also, the surveys from customers and potential occasional drivers gives the perspective of the people in the Netherlands, which adds value in theory and in practice.

An important practical aspect is the business model innovation that the research offers. It is important for companies to transition their focus on sustainable and green logistics, and live up to this prospect in order for the propositions to sell well due to the high eco-friendly affinity in the country. As seen in the research, the concept can prove to be green only if implemented in a certain way or for certain tasks in the logistical systems. The start-up, third-party platform provider perspective is derived to be more straight forward in practice, due to the opportunities and the possibility of implementing Crowd-Shipping with the right drivers and eliminating as many challenges as possible. Also, a third party platform based provider for logistics does not locally exist in the Netherlands except for companies such as Nimber and PiggyBee, which operate across Europe, focusing on inter-country travel. Therefore, start-ups focusing on logistics or entrepreneurs who want to enter the logistics sector can focus on the business model innovation aspect provided in the discussion of this research, especially with respect to certain elements such as the value propositions and key partners, by taking into account the existing business models of other start-ups and rectify where they may be faltering.

Although the overall opinions of the experts may indicate their hesitance for this concept, their insight on how it can be implemented if the scenario arises may help companies study its feasibility and therefore implement it. Companies would first need to address the most crucial factors such as increase in costs, division of tasks, ensuring loyalty and customer trust, and addressing the need to create adequate supply and demand of occasional drivers. Companies also need to conduct in-depth research or analyse how many customers would be willing to accept the changes that are made and then proceed with making decisions regarding implementation. In the Netherlands, the existing logistical infrastructure is found to be extremely efficient currently due to its small geographical area and infrastructure with respect to built environment. Therefore, big companies need a very strong value proposition (Osterwalder et al., 2014) and operational model to actually

realise in Crowd-Shipping in practice.

The practical aspects of the stakeholder perspectives and business model aspect can be studied further can be enhanced by conducting more interviews and surveys, while also focusing more on businesses (retailers, e-commerce retailers), which will enable in Crowd-Shipping a practical reality in the Netherlands.

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## 6 Conclusion

The conclusion of the research will give an overview of the entire research as well as answer the main research question.

The research conducted begins with the background study or the introduction which discusses the concept of Crowd-Shipping and its growth across countries in the world which are facing high demand in deliveries due to the gigantic growth of the e-commerce domain. Logistics companies have had to come up with innovative solutions in the last two decades to tackle this growth and these companies work tirelessly to ensure all stakeholders, mainly customers are satisfied with their delivery methods. However, the growth of e-commerce is projected to rise upwards especially due to the pandemic and customers' reliance on e-commerce shopping. Crowd-Shipping is an innovative new concept that came about in several countries where regular, travelling people who have time and space can accommodate a package while heading towards a pre-planned destination and dropping the package off to a customer who lies along the same route. The research then focuses on how Crowd-Shipping offers a set of benefits backed by existing research but has not been implemented in the Netherlands, where e-commerce demand has seen a significant growth as well. The research objective tries to find how the concept can be implemented or deployed in the Netherlands, backed by addressing a set of drivers and barriers as well as developing a business model or making changes in existing business models, which companies may make use of in the future if Crowd-Shipping is an option for them.

A thorough literature review was conducted primarily focusing on the nature of the concept, what drives or motivates companies or countries to bring about the concept, what challenges or blocks the implementation of the concept and business models backed with the existing business models of Crowd-Shipping companies as well as big logistics companies. The literature gave insight to several key drivers and barriers that influence stakeholders involved in Crowd-Shipping implementation while deriving a research gap which can be described as a gap for an overall, broad perspective of how drivers and barriers of Crowd-Shipping in the eyes of all stakeholders involved has not yet been studied. Along with the above, concepts of business model innovation and transition need to be addressed as these give a practical perspective as to how start-ups or established companies can develop a plan or a model if they are planning to deploy Crowd-Shipping.

Moving on to addressing the objective, mixed methods of research were used consisting of a set of semi-structured interviews with logistical experts of big logistics companies, an expert from a start-up company and one legislative expert to provide a regulatory/legislative viewpoint on Crowd-Shipping and two surveys for customers and potential occasional drivers. The interviews were first conducted to explore the drivers and barriers found through the literature and find more drivers and barriers and also business model perspectives, which were helpful in framing the questionnaires. Then, surveys were conducted to explore the perspectives of customers and occasional drivers and find out what are the drivers and barriers that motivate or discourage them from using Crowd-Shipping services. The findings from the interviews provided us fresh perspectives, validating some of the earlier found drivers and barriers through the literature review, while also providing insight on how some of the drivers can be barriers and vice-versa. The interviews also provided

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us perspective on developing business models for start-ups as well as how big companies can make changes in their existing business models to incorporate Crowd-Shipping services, albeit indicating a first-mover disadvantage for big companies. The surveys from the customers and occasional drivers indicated the extent to which the drivers and barriers affect or do not affect the willingness of the Crowd, most of which were in-line with the literature review and the interview findings, although some new revelations were discovered especially with barriers such as data privacy not affecting the crowd as much as literature claimed it would.

Post further analysis of the findings and considering all the drivers, barriers and business model aspects, we have gathered adequate data to answer the main research question: *How can Crowd-Shipping be successfully deployed in the Netherlands?*

Crowd-Shipping can prove to be a feasible concept if deployed taking several aspects into consideration without which, it may not be useful in a country like the Netherlands which has a highly efficient existing logistical infrastructure. To implement Crowd-Shipping, the most ideal way would be to develop a third-party platform or service provider, which works on an application that can enable the integration of all stakeholders, also due to the fact that the findings suggest there is a first mover disadvantage/hesitation for big logistics companies. The platform primarily needs to have connections with different businesses, logistics companies and the crowd, through which an efficient system of matching can take place. Also, the third party provider can minimise costs by investing in minimal infrastructure requirements which could be an ICT platform, a real-estate space (office space), efficient but minimum human resources and a few vehicles in the case of back-up required. Businesses which prefer same-day, more flexible delivery with respect to time or want to bypass several sorting centres, warehouses before delivering the package to the customer can possibly make use of the platform and connect with the third-party provider. Also, the third-party provider need to conduct a thorough market research with businesses and consumers to ensure adequate compliance from both parties and adequate demand is present to make the concept successful.

The inclusion of flexibility, cheaper delivery charges, green logistics, reverse logistics as well as the provision of insurance and occasional driver details will provide customers the comfort of safety, societal and financial benefits. To ensure green logistics becomes a reality, the company can acquire or depend on occasional drivers who are in possession of electric vehicles such as cars or bikes, thus fulfilling the proposition with integrity as people in the Netherlands have affinity towards eco-friendliness and negating any sort of negative externalities. Data privacy could be a compromise theoretically but in reality, all shared economy platforms have been successful in protecting consumer rights despite occasional setbacks. Another way the third party platform can come into use is for big logistics companies who at times may not be able to handle the demand or have far too many orders to fulfil in a short period of time, can use the platform to meet these demands occasionally and effectively, provided the propositions and compliance are in place and the principles of the logistics companies are aligned with the principles of the third party provider. Logistics companies and third-party providers can also be in close communication with respect to negotiations for deliveries, especially when demand grows higher and companies may seek more involvement from the third party providers.

Therefore, to conclude the research, Crowd-Shipping is a potentially useful approach in logistics for the Netherlands, if implemented by addressing the set of drivers and barriers along with specific details of the business models. However, if deployed, companies may have to look out for policy implications, which may arise with the deployment becoming successful. Future work can focus on a more holistic approach by adding business perspectives and conducting a more extensive research in terms of the sample sizes and viewpoints. Limitations and recommendations have been elaborated on in the following section.

## 6.1 Limitations and Further Recommendations

There are a few limitations in this research which could be addressed in future research. The first limitation of the research is the lack of a business perspective on Crowd-Shipping services. Businesses play an equally crucial role in the concept to work and therefore, it is important to address businesses' opinion on the concept. They have the ultimate responsibility of ensuring their items or products reach their customers and put their trust in logistics companies. If the trust is threatened due to Crowd-Shipping, businesses may have to look for alternatives and ensure new ways of reaching out to customers.

The sample sizes for the surveys are relatively small due to time constraints and the accessibility due to the pandemic. However, 216 responses are good enough to give decent insight on how customers and potential occasional drivers perceive Crowd-Shipping. Furthermore, the analysis of these surveys are limited to descriptive statistics and correlation analysis. More in-depth analysis can be conducted such as regressions and hypothesis development and testing. The sample size for logistical experts however covers major logistics companies in the Netherlands and could be sufficient in drawing valuable insight. More interviews could be conducted with higher officials in these companies and key decision makers especially in the last-mile delivery domain. Policy experts also can be drawn from different municipalities or regions of the Netherlands to find out if there are region specific regulations that could affect Crowd-Shipping activities.

For the surveys, constructs can also be developed in order to gain more in-depth insight from the Crowd perspective. Factors within the factors can be addressed to make valuable constructs through which more analysis (correlations and regressions, factor analysis, hypothesis testing) can be conducted using statistical tools such as JASP and SPSS which provide a wide range of options. With the COVID-19 pandemic possibly reaching its far end, more possibilities can arise with regard to reaching out to more people and conducting pilot programs to test the feasibility and acceptance of Crowd-Shipping, through which research can be generated. Also, a cost-benefit analysis is highly recommended to give accurate financial data for companies if they plan to deploy Crowd-Shipping.

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## A Survey Form for Customers

### Research Questionnaire for Customers

You are being invited to participate in a research study titled Developing a framework for the deployment of Crowd-Shipping: A Case Study in the Netherlands. This study is being done by Sameer Rajwade from the TU Delft.

The purpose of this questionnaire is to understand the factors customers or consumers consider while receiving a package from logistics companies through Crowd-Shipping services. This will enable me in deriving a set of factors and barriers companies would face if Crowd-Shipping is implemented.

The thesis titled 'Developing a framework for the deployment of Crowd-Shipping in the Netherlands: A Case Study' focuses on the concept of Crowd-Shipping which is also known as Crowd-Sourcing, Cargo-Hitching etc. Crowd-Shipping is a concept that allows companies involved in logistics, supply-chains to deliver goods/packages to customers through regular travellers/commuters, who are willing to take a small detour in their travel to deliver these goods for a small compensation.

For further context, platforms such as Uber Eats, Nimber, Dunzo and PiggyBee are Crowd-Shipping platforms where people can match with consumers and enable a delivery for a particular fee and mutually agreed time-frame. As an example, imagine you have ordered something from Amazon and DHL is the logistics partner for Amazon. Instead of a DHL delivery partner, a regular person who is travelling along DHL's warehouse location to a place near the delivery location will deliver your package to you. The potential benefits that this concept has to offer are reduced road traffic as delivery vans reduce, reduced CO2 emissions, reduction in delivery times, lower delivery charges and reduced costs for companies.

Your participation in this study is entirely voluntary and you can withdraw at any time. You are free to omit any question.

We believe there are no known risks associated with this research study; however, as with any online related activity the risk of a breach is always possible. To the best of our ability your answers in this study will remain confidential. Your answers will not be traced back by you. Do consider forwarding this survey to your network.

Thank you for your participation and support.  
Sameer Rajwade  
S.Rajwade@student.tudelft.nl

What is your profession or occupation? \*

- Student
- Part-time employee
- Homemaker
- Full-time employee
- Unemployed temporarily
- Unemployed, not looking for employment
- Retired
- Other...

---

Are you familiar with the concept of Crowd-Shipping? \*

Yes

No

How is your area of settlement classified? \*

Urban area

Rural area

Other...

Would you consider yourself as an environmental friendly person? \*

	1	2	3	4	5	
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

---

Have you utilized Crowd-Shipping services before? (UberEats, Nimber, Dunzo, etc.) \*

- Yes
- No
- Maybe

Have you used Shared Economy platforms before? (Uber ride sharing, AirBnb, Marketplace, etc.) \*

- Yes
- No
- Maybe

How often do you use e-commerce portals to shop? (Amazon, Bol.com etc.) \*

- Less than once a month
- Once a month
- 2-5 times a month
- >5 times a month

---

⋮

On an average, how much do you spend on e-commerce shopping in euros? \*

- 0-20
- 20-40
- 40-60
- >60

Among the following options, what are the items that you would most likely buy online? \*

- Clothes
- Household items
- Books
- Electronics
- Food
- Cosmetics/Health
- Jewellery
- Other...



---

If Crowd-Shipping were to be implemented by a logistical company, which among these item categories would you be okay receiving from a Crowd-Shipper? \*

- Clothes
- Household items
- Books
- Electronics
- Food
- Cosmetics/Health
- Jewellery
- Other...

If you have an option to receive a package from a Crowd-Shipper, to what extent would you consider it based on the following factors:

You can choose from a 5 point scale which ranges from Strongly Disagree to Strongly Agree. Your agreeableness will determine to what extent you consider accepting a Crowd-Shipped package based on the following factors.

To what extent would you consider receiving a package from a Crowd-Shipper based on the availability of his/her details (name, email address, phone number)? \*

	1	2	3	4	5	
Very Low	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very High

---

To what extent would you consider receiving a package from a Crowd-Shipper based on the cost of the delivery charge in comparison with the traditional delivery option? \*

	1	2	3	4	5	
Very Low	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very High

To what extent would you consider receiving a package from a Crowd-Shipper based on a sense of community/helping people find sources of income? \*

	1	2	3	4	5	
Very Low	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very High

Would you consider receiving a package from a Crowd-Shipper based on a sense of community by contributing to the potential reduction of CO2 emissions? \*

	1	2	3	4	5	
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

To what extent would you consider receiving a package from a Crowd-Shipper based on the weight and size of the package? \*

	1	2	3	4	5	
Very Low	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very High

---

To what extent would you consider receiving a package from a Crowd-Shipper based on the amount of money spent on the package? (value of the item) \*

	1	2	3	4	5	
Very Low	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very High

To what extent would you consider receiving a package from a Crowd-Shipper based on the flexibility offered by Crowd-Shipping in terms of delivery time? (Customers can potentially choose the delivery date and time) \*

	1	2	3	4	5	
Very Low	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very High

To what extent would you consider receiving a package from a Crowd-Shipper based on the number of packages scheduled to be delivered by the Crowd-Shipper? (can vary from single to multiple packages) \*

	1	2	3	4	5	
Very Low	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very High

To what extent would you consider receiving a package from a Crowd-Shipper based on the safety of the package? (Safety with respect to theft, damage) \*

	1	2	3	4	5	
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To what extent would you consider receiving a package from a Crowd-Shipper based on the Insurance/Liability coverage associated with the delivery partner or package in case of accidents/wrong-doing/damaged goods? \*

	1	2	3	4	5	
Very Low	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very High

To what extent would you consider receiving a package from a Crowd-Shipper based on the reviews of previous deliveries performed by him/her? (Similar to how Uber Drivers are rated) \*

	1	2	3	4	5	
Very Low	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very High

To what extent would privacy related issues (your address, phone number provided to the delivery partner) affect your willingness to receive a package from a Crowd-Shipper? \*

	1	2	3	4	5	
Very Low	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very High

If the Crowd-Shipper has previous experience as a delivery partner/courier, to what extent would it affect your willingness to receive a package? \*

	1	2	3	4	5	
Very Low	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very High

---

Would you consider receiving a package from a Crowd-Shipper based on the scale and size of the company (start-ups vs big companies like DHL/Fedex)? \*

Strongly Disagree      1      2      3      4      5      Strongly Agree

Do you think Crowd-Shipping would be a useful form of last-mile delivery/logistics in the Netherlands? \*

Yes

No

Maybe

Are there other factors that you would consider while receiving a package from a Crowd-Shipper? \*

Short answer text  
.....

Are there other barriers that would affect your willingness to receive a package from a Crowd-Shipper? \*

Short answer text  
.....

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## B Survey Form for Occasional Drivers

### Research Questionnaire for Potential Occasional Drivers

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You are being invited to participate in a research study titled Developing a framework for the deployment of Crowd-Shipping: A Case Study in the Netherlands. This study is being done by Sameer Rajwade from the TU Delft.

The purpose of this questionnaire is to understand the factors drivers or Crowd-Shippers take into account while performing delivery tasks for logistics companies. This will enable me in deriving a set of factors and barriers companies would face if Crowd-Shipping is implemented.

The thesis titled 'Developing a framework for the deployment of Crowd-Shipping in the Netherlands: A Case Study' focuses on the concept of Crowd-Shipping which is also known as Crowd-Sourcing, Cargo-Hitching etc. Crowd-Shipping is a concept that allows companies involved in logistics, supply-chains to deliver goods/packages to customers through regular travellers/commuters, who are willing to take a small detour in their travel to deliver these goods for a small compensation.

For further context, platforms such as Uber Eats, Nimber, Dunzo and PiggyBee are Crowd-Shipping platforms where people can match with consumers and enable a delivery for a particular fee and mutually agreed time-frame. As an example, imagine you have ordered something from Amazon and DHL is the logistics partner for Amazon. Instead of a DHL delivery partner, a regular person who is travelling along DHL's warehouse location to a place near the delivery location will deliver your package to you. The potential benefits that this concept has to offer are reduced road traffic as delivery vans reduce, reduced CO2 emissions, reduction in delivery times, lower delivery charges and reduced costs for companies.

Your participation in this study is entirely voluntary and you can withdraw at any time. You are free to omit any question.

We believe there are no known risks associated with this research study; however, as with any online related activity the risk of a breach is always possible. To the best of our ability your answers in this study will remain confidential. Your answers will not be traced back by you. Do consider forwarding this survey to your network.

Thank you for your participation and support.  
Sameer Rajwade  
S.Rajwade@student.tudelft.nl

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Are you familiar with the concept of Crowd-Shipping? \*

Yes

No

Have you utilized Crowd-Shipping services before? \*

Yes

No

Maybe

Have you worked as a delivery partner/driver before for restaurants/companies? \*

Yes

No

Would you consider yourself as an environmental friendly person?

Strongly Disagree      1      2      3      4      5      Strongly Agree

Do you take measures to reduce environmental harm or carbon footprints in terms of mobility/transport?

Yes

No

Maybe

---

If you have an option to deliver packages as a Crowd-Shipper, to what extent would you consider it based on the following factors:

You can choose from a 5 point scale which ranges from Strongly Disagree to Strongly Agree. Your agreeableness will determine to what extent you consider performing Crowd-Shipping tasks based on the following factors.

To what extent would you consider working as a Crowd-Shipper because of an additional source \* of income/compensation?

	1	2	3	4	5	
Very Low	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very High

⋮

Would you consider working as a Crowd-Shipper because of a potential sense of community or \* contributing to the reduction of CO2 emissions?

	1	2	3	4	5	
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

To what extent would the weight and size of the package to be delivered affect your willingness \* to work as a Crowd-Shipper?

	1	2	3	4	5	
Very Low	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very High



---

To what extent would the number of packages to be delivered affect your willingness to work as a Crowd-Shipper? (can vary from single to multiple packages) \*

	1	2	3	4	5	
Very Low	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very High

To what extent would the time taken for performing the task affect your willingness to work as a Crowd-Shipper? \*

	1	2	3	4	5	
Very Low	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very High

To what extent would the magnitude of deviation from your original route affect your willingness to work as a Crowd-Shipper? \*

	1	2	3	4	5	
Very Low	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very High

---

Would the insurance coverage for you or the package provided by the company affect your willingness to work as a Crowd-Shipper? \*

Strongly Disagree      1      2      3      4      5      Strongly Agree

Would the geographical setting of the delivery task (Urban Area, Rural Area) affect your willingness to work as a Crowd-Shipper? \*

Strongly Disagree      1      2      3      4      5      Strongly Agree

If the company and the customer would enable live tracking of your journey, to what extent would it affect your willingness to work as a Crowd-Shipper? \*

Very Low      1      2      3      4      5      Very High

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To what extent would you consider working as a Crowd-Shipper based on the company's history \*  
or reputation?

Very Low      1      2      3      4      5      Very High

In the case of additional income, which of these factors would you consider most while \*  
accepting the delivery task?

	Income equivalent ...	Income based on d...	Income based on ti...	Income based on ...
First Choice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Second Choice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Third Choice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Are there other factors that you would consider while delivering a package as a Crowd-Shipper? \*

Short answer text  
.....

Are there other barriers that you would worry about while delivering a package as a Crowd-Shipper? \*

Short answer text  
.....

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## C Interview Summaries

### C.1 Interview with Logistical Professional-1

The interviewee is an operations manager for a large logistics company in the Netherlands. The interviewee was asked of his knowledge of Crowd-Shipping in general for which he knew of the concept due to a start-up in the Netherlands which tried to implement it but failed to do so. "One of the reasons why this did not work out here is because the Dutch are always in a hurry, they do not find time to do something for another person especially if they need to hop around between cities". In his opinion, the Netherlands is a country with people who have busy schedules and hardly find time to take detours in order to deliver something to someone.

The interviewee further suggested that the existing drivers in his company earn a fair amount of money by performing delivery tasks. The drivers of the company also perform other tasks such as warehouse loading, unloading, sorting and so on. They are paid heavily due to the combination of the tasks that they perform. Crowd-Shipping will be able to eliminate the costs with respect to the driver and the costs of the van utilized for deliveries including factors such as depreciation costs. Also, the company would have to go through a stage of investments to facilitate the concept such as warehouses closer to cities and e-bikes. Having Crowd-Shipping on board does look like an option that could be cost-effective but the logistical company does require people who perform a lot of back end work which cannot be the case if the concept is implemented, therefore suggesting that cost-effectiveness is not practical. In this case, if the company is looking to implement Crowd-Shipping as a means of saving money, will in fact reduce their revenues as the delivery charges for occasional drivers will take the cake. Regular drivers perform all duties for their fixed wages while also receiving incentives for the number of deliveries. With respect to the environmental benefits, the substitution of vans which do several deliveries on a single street by the same number of cars as the packages delivering them will again not serve as an environmental benefit but as a greenwash.

Moving on to how the concept could work, the interviewee suggests that there are several factors that need to be taken into account and worked on if his company wants to make this work. One is with respect to the integration of regular operations with respect to Crowd-Shipping operations. He suggests that Crowd-Shipping may not work for package deliveries between cities due to the Dutch being in a hurry and no actual benefit being offered to the driver and customer due to the large distance being covered. The company can attract a supply of drivers within cities, who operate on e-bikes or manual bicycles to perform delivery tasks, which will disable the need for vans to go around the cities. The packages from the distribution centres or hubs can be transported through the current method of trucks or vans. This is basically division of the work between traditional and Crowd logistics. This can be a cost-effective and an environmental friendly method for the company which can also add an element of selling the business model to consumers as cheaper and greener deliveries. However, he also suggests that the Netherlands currently misses a consumer to consumer dimension of logistics as well as an efficient consumer to business logistics in the case of reverse logistics of packages. Crowd-Shipping can be an interesting element in these cases which companies can explore in the future whilst also adding on to their value proposition.

The company's current business model works based on a mission to generate trust, credibility and efficiency.

With respect to trust, privacy and other legislation, the drivers who are hired for these activities will need to build trust through a system of reviews or ratings, have an efficient communication tool in order to interact with customers at the time of the delivery and also come to an agreement with customers before accepting the delivery tasks. The wage system for these drivers can be explored within the price per km, time, time of the day as well as number of deliveries which can also be seen in other shared economy platforms such as Uber. Another barrier is the fact that how will the occasional drivers behave or how will they handle the packages as they are not trained.

## C.2 Interview with Logistical Professional-2

The interviewee is a Supply Chain and Logistics Consultant for a logistical firm based in the Netherlands and serving the Benelux area. The interviewee is well aware of Crowd-Shipping activities existing in other countries and also spoke about the attempt to implement Crowd-Shipping by a start-up in the Netherlands due to the growth in e-commerce operations.

Beginning with innovation, the interviewee suggests that the company's core values remain rooted to the Netherlands and this ensures that the company also gives importance to innovating for a greener future. He claims that the company have done relatively higher amount of greener good in terms of deliveries and logistics in comparison with the other logistics companies operating in the Netherlands. When asked to elaborate further he suggested that bicycle deliveries have been increasing since the inception of the idea and have been extremely efficient in delivering small parcels and documents across the country. He believes that the company has also built its efficiency and green objectives by having the largest number of pick-up points which are of close proximity to most localities in urban and rural areas. Customer satisfaction and loyalty, delivery quality along with employee loyalty has also worked wonders thus far for the company.

Speaking of the possibilities of the interviewee's company to implement Crowd-Shipping, he claims that his company conduct logistical activities similar to Crowd-Shipping although some of the drivers are contracted or hired based on a lease. Due to the growing nature of deliveries, specifically e-commerce operations, the company have grown multiple folds in the last fiscal year as the Netherlands had been in lockdown. Due to these circumstances, the interviewee claims that the company does recognise the need to occasionally hire the odd driver to perform excess delivery tasks. However, the vehicles used for these deliveries need to be brought by the hired drivers and are not given by the company, which he feels could be a barrier if Crowd-Shipping were implemented on a large scale. Elaborating further, he added "if these sort of short-term hiring and flex contracts become common, we would not be able to completely depend on each and every one of them. It is a huge trade-off for us while trying to satisfy delivery demands on time as well as ensuring customer safety and reputation. Not being able to provide a means to such drivers is surely going to affect us when we have to switch to hybrid or electric vehicles". Also, these drivers do not like to be tracked by the company as they are not contract bound.

The interviewee believes businesses have a key role in enabling the large logistics companies to implement Crowd-Shipping. Since companies are tied up with various businesses selling goods online, the companies need to adhere to how businesses feel about the safety of their packages when sent with occasional drivers. In order to make this work, the company will have to pitch in lower delivery charges that are attractive to both businesses and consumers but he thinks this is essentially going to complicate an already existing, efficient relationship with parties on both sides of the supply chain. By stating the above, the interviewee also emphasises on the image factor, which has been built over decades and could be at a certain level of risk. However, he also believes that the lease contracted drivers also drive with vehicles without logos and names, and that has worked very well for the company.

Moving on to the drivers and barriers, the interviewee suggests that the biggest drivers from a company perspective have to be growing demand for deliveries. If the demand for deliveries do not grow, existing systems which are in place are adequate to meet the demand. Cost-cutting attributes would be the next driver for Crowd-Shipping services but a thorough analysis of this needs to be produced in order to come to a conclusion. Since the company believes in high employee loyalty, the interviewee suggests that this value would never be eliminated if there are propositions to bring in Crowd-Shipping. The interviewee also mentions that working hours of Crowd-Shippers need to be considered more than anything else for deliveries citing an example from the pandemic. The barriers in the interviewee's opinion are customer satisfaction and compliance, business compliance and matching the need for Crowd-Shipping deliveries if the concept is a success. This is an interesting barrier which could work against the company. In scenarios of low delivery demand, Crowd-Shipping demand may go down risking the availability of regular Crowd-Shippers when demand rises again.

From a business model perspective, the interviewee believes in strategically working with stakeholders such as businesses and regulatory authorities as well as analysing market trends for deliveries could give a clear perspective. Within this, providing cheap delivery propositions and environmental friendly measures could play a winning role.

### **C.3 Interview with Logistical Professional-3**

The interviewee is a senior logistics manager for a big logistical firm that operates in several countries including the Netherlands. She has rich experience in the customer service segment as well as logistical operations of this company. In her opinion, Crowd-Shipping is a great concept but not completely suitable for the Netherlands. The Dutch are not that trusting of others to do their tasks which is usually done by professionals. Also, she believes geographical area and proximity are crucial factors in implementing Crowd-Shipping services and finds this reason as why this concept is successful in countries like the United States, India and China. According to her, the Netherlands being a fairly small country and with less people, the current logistical system is extremely efficient and there is inadequate demand for Crowd-Shipping operations especially with respect to package deliveries, which are fulfilled by the bigger firms in quick time and less prices.

With respect to her company, the business model mainly works on attracting a set of customers which include businesses as well as private customers to a subscription like model, where they are charged a fee for it which will get them benefits such as discounted delivery rates and other benefits. They also work on a route optimization policy for all deliveries within cities and across cities, which enables the company to provide cheaper delivery prices as well as save costs for fuel consumption. The company's tasks in package deliveries mainly focus on collecting, sorting and delivery through greener supply chains. If this company were to add Crowd-Shipping services, she believes that the company could risk tarnishing its credibility as the company is quite possessive about its intangible assets such as customer trust, reputation, and quality of service. Integration of Crowd-Shipping could work in reducing costs but she adds "At what cost will this provide us lower expenses?". If the company does decide to go ahead with Crowd-Shipping, the value proposition could be cheaper and greener delivery if electric vehicles are to be used by the Crowd. However, the latest climate agreements across the world compel people and companies to move into electric vehicles soon anyway, therefore implying that Crowd-Shipping is a short-term green delivery option.

Regarding the barriers of Crowd-Shipping, the interviewee's insights provided a very important aspect which has not been tapped upon yet in this research. The drivers who currently work at her company have seen an exponential growth in the number of tasks to be completed due to the pandemic influencing the e-commerce operations heavily. "Some drivers complete a total of 150 deliveries a day". The company vouches for these drivers and has the duty to provide appropriate social security for them in most situations, especially at this time frame. The Netherlands as a country does not see people getting laid off at their companies like in the US. The social security factor here is high and companies need to adhere to these regulations. Therefore, integrating Crowd-Shipping services with regular logistics may see a reduction in existing employees, which goes against company policies and values with respect to social security. Also, providing social security to Crowd-Shipping drivers is a challenge as can be seen with companies like Uber, Thuis-Bezorgd and Deliveroo, where contracted drivers are not backed enough by companies regarding wages. Valuing the time put in by drivers for delivery jobs is something to ponder upon as each individual values time differently.

Crowd-Shipping also brings along a wage barrier. As mentioned in the interview 1, the drivers employed in her company perform several tasks other than just driving and delivering. The revenue generated from Crowd-Shipping will be marginal compared to existing revenues. However, she suggests that a C2C model would work in the Netherlands as this does not exist thus far. A C2B model could also work in bigger cities where some of the pick-up points may not always be closely located to customers and also this could help in eliminating the deployment of vehicles just for the reverse logistics of packages. The taxi driver model could work here, as several drivers drive around cities at all times and can accommodate these packages for a small compensation. Trust factor comes into play at all times. Insurance and an efficient ICT application that enables seamless communication will be extremely useful for customers and drivers, especially for customers who are sceptical of utilizing this service. Also, the Crowd-Shipping option should be provided as an alternative to regular logistics, not as the only option. The business can then be built based on how it picks up and how revenue is generated from this. Another major drawback is the fact that drivers do not like to be tracked and customers always want to know where drivers are. For

this, her company has set up two hour time windows that show the customer when the package will arrive. This could also be an option for Crowd-Shipping as occasional drivers may not be comfortable with live tracking and tracing.

Packages need to be insured as is done currently by most big logistics companies. Also, Crowd-Shipping operations can find an interesting start with the marketplace, which currently lacks delivery options. Since the business model of the marketplace relies on cheaper goods, cheaper delivery can be a great addition to this and can potentially work wonders. Again, trust becomes a major factor with respect to goods.

#### **C.4 Interview with logistical professional-4**

The interviewee is a logistical professional working at a Start-Up company which is originated in Norway but has operations in the Netherlands while also planning to start a full-fledged operation in the Netherlands as a base. He suggests that Crowd-Shipping can be categorized as a shared economy platform like Uber and AirBnb, where customers and drivers should be able to match and negotiate their activities. The company operates on three scales: B2C, B2B and C2C. Generally Crowd-Shipping is perceived mainly as a B2C and C2C concept, where occasional drivers find an opportunity to deliver packages to customers who have ordered from a business/retailer or need something to be delivered to a person of concern. This company performs B2B tasks through the crowd which is innovative in the logistical sector. The three main factors that influence this operation is on-time delivery, cost-effective and safety. These factors can be met through what the interviewee calls 'Trusted Bringers'. Trusted bringers can be defined as the drivers who have been doing these tasks for a long time and are always available to fulfil the companies delivery demands. Trusted bringers build their reputation after performing a set of deliveries with efficiency and safety. They are not bound by contracts but share a middle-ground between being an employee and a non-employee through this built reputation. An interesting barrier that the interviewee suggests is the fact that sometimes these drivers try to use this opportunity as a full-time revenue means. Therefore bringing an imbalance between the supply and demand of delivery tasks and drivers. This in turn affects the proposition of the company of providing cheaper delivery than traditional logistics.

Another important assessment from the interviewee is the fact that Crowd-Shipping offers a certain extent of flexibility with respect to delivery dates and times which sometimes traditional deliveries cannot offer. Also, there is a direct correlation between environmental friendliness in people and opting for this service. Therefore, the interviewee feels a country like the Netherlands or Norway where there is a sense of community with respect to being eco-friendly will add to the proposition of bringing this service to the Netherlands. In terms of the business model, the interviewee brings in the aspect of selling the company as an IT platform or ICT platform, that just behaves as a mediator in bringing customers and companies/drivers together. There is a tool for communication through which customers will know when, where, how and how much the delivery will be. In the perception of customers, the company sells itself as a greener and flexible logistical option and a cheaper delivery option which as mentioned earlier works in societies with high sense



of community for eco-friendliness.

The biggest barriers in the case of Crowd-Shipping is attracting trusted drivers or bringers as well as trying to match the supply and demand of drivers and customers. Due to the pandemic, several people found the time to participate as drivers to earn some extra revenue. However, people are going back to their old routines professionally and personally thereby bringing in a challenge of finding enough drivers to fulfil delivery demands. Another crucial barrier is the reverse logistics aspect. If a customer is not at the preferred delivery location at the time of delivery, the driver needs to know about this and be given a solution to drop off the package. Sometimes drivers complete other tasks and come back to deliver this package, but if there are no other tasks, the driver will have to communicate to the customer and find a solution. This is where the need for an effective ICT application comes in. Easy communication between the customer and driver will be a problem solver for this more often than not. The application in his words need to be simple and clear while providing every single detail to the two stakeholders at all times.

Discussing the wage model and potential entry for big logistical firms, the interviewee suggested that the company has 3 different models. For the C2C, the customers and drivers have to negotiate a price from which the company gets a small service and insurance fee. For B2C and B2B, the company negotiates a certain amount with the businesses which is based on cheaper, safe, better service and time-efficiency in comparison with traditional logistics. In this case, the company needs to be wise enough and decide a price which will also serve a fair enough revenue for both the driver and the company. For deliveries within city limits, the drivers are usually paid on an hourly wage basis as paying drivers based on deliveries would exceed the costs by too much and will erode the revenue earned by the company. For bigger firms to enter this market, the interviewee suggests that companies will have to focus on standardized good which may not require elements like proper packaging and items that are perishable. Otherwise customers may prefer Crowd-Shipping services due to cheaper and flexible deliveries.

In terms of legislation, data privacy is a huge deal in any country. Despite drivers not caring too much about the personal details of the customers, the company ensures that the driver does not communicate with customers once the delivery task is complete. Also, insurance plays a huge role in providing an aspect of trust to the customers. The company insures packages for an amount of upto €1000 which customers are satisfied about. An another interesting point to be noted is the fact that legislation always catch up to innovation and not the other way around. Regulations are introduced once things start to go haywire in case of new, innovative technologies or services that are introduced into the market.

## **C.5 Interview with Legislative Professional-1**

The interviewee is a policy expert for a municipality and specialises in policies for transportation and logistics. Speaking of the interviewee's general views on Crowd-Shipping implementation, he suggests that the government has a free-market approach, which essentially allows companies to operate in a way that they strive to. In this case, the government does not incentivise certain steps

taken by logistics companies implementing newer concepts in their operations. Elaborating further, the interviewee says "They can do their own thing as of now as we see not many advantages or disadvantages by collaborating". As an example, he provided a few policy goals such as ensuring weight limits, fewer emissions and driving less, which the government hopes to get compliance for and if achieved, they would not want to meddle with the company's business models.

The policy goals in the Netherlands currently aim at zero emissions for freight transportation by 2030 along with other vehicles. The aim is to allow a transition from the year 2025 to 2030 by slowly curbing a few areas of cities from being used by carbon emitting vehicles. The weight restrictions as of now for all deliveries is about 7.5 tonnes for trucks and 3.5 tonnes for vans but there are no restrictions for bikes and cars. He believes these restrictions can favour Crowd-Shipping services as cars and bikes are allowed at all times on the roads. There are also regulations with respect to food safety in packages. Speaking of data privacy issues, the interviewee debunks data privacy concerns with respect to deliveries. He says "People just want their package. Although I live in a smaller town, I am completely okay with my neighbours having my package. This could be a factor in bigger cities where you don't know your neighbours. But it is not that much of a concern as of now".

The interviewee thinks that flexibility is a great proposition for Crowd-Shipping, something that does not exist but believes the country has an extremely efficient logistical system and , current propositions are good enough for the country. This could work for businesses such as food and alcohol. If this becomes too successful, he feels that some regulations will come into place. For example uncontrollable road traffic occupied by cars or bikes as well as irregular parking space utilisation by Crowd-Shippers. At the moment the government is working on a set of rules for cargo bikes, which the interviewee cannot share as of now. These rules may also apply to Crowd-Shipping if implemented. The rules may apply towards issues such as parking on the sidewalks or pedestrian paths for which there are no rules as of now.

Moving to the barriers, he says real estate and the built environment is one of the biggest barriers for companies. They will have to find locations closer to areas which have high delivery demand in order to smoothly integrate Crowd-Shipping. The barrier may also serve as an opportunity for companies to save capital as there are few spaces suitable for logistics and sharing spaces. The companies need to let loose their brand as well, which is a key barrier. Highlighting further, the interviewee suggests that the government has no opinion on this. The potential of Crowd-Shipping is difficult to tell as of now. Also, since policy goals call for full zero emission vehicle transition from 2025 onwards, it may be difficult for Crowd-Shippers to invest in their own eco-friendly vehicles, potentially disrupting Crowd-Shipping demand and supply.

Speaking of wages and working hours, the government has a role in ensuring people get their due with respect to wages and time spent on performing a duty. Also, people may risk losing their jobs and as the government, they want to protect them as much as possible. But this is more for the company to manage.