First scan for the potential adoption of a sustainable city logistics model: The case of PostNL

Master thesis Sustainable Business and Innovation

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First scan for the potential adoption of a sustainable city logistics model: The case of PostNL

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Summary

Introduction: Innovation is a major factor in business survival and in achieving and sustaining competitive advantage. This can be visualized in the Product Life Cycle (PLC), which details how sources of competitive advantage can change over time. Emphasis is placed on incumbents, which react slowly to change and rarely introduce innovations, although the process of innovation is highly relevant in order for them to maintain a competitive position whilst dealing with external changes. **Case:** This thesis focused on a specific Dutch incumbent: PostNL, which introduced a new, innovative department in Delft: 'City Logistics'. City Logistics aims to create a logistical hub at the outskirts of Delft, from which small electric vehicles provide flexible delivery and retrieval services, whilst simultaneously inflicting a minimized impact on the environment. In order for PostNL to be able to explore this new sustainable business model, five sustainable services were designed, namely: bundling of supplies, same day delivery, delivery on another day, express delivery and collection of dry waste. The rate in which this innovation was perceived as relevant by individuals was determined by the rate of adoption, which includes five attributes: relative advantage, compatibility, complexity, trialability and observability. This research investigated which of these services had the highest potential to be adopted by the retailers in Delft, combined with their willingness to pay. **Method:** Data was collected from 143 retailers using a specifically developed questionnaire. Chronbach's alpha's were calculated. Data was analyzed using factorial analyses and one-way repeated measures ANOVA's. Logistical regression analyses were performed to test a newly developed conceptual model. **Results:** Respondents were generally negative towards the sustainable services. However, more than half (56%) of the retailers intent to use the services in the future. Same day delivery had the highest scores on relative advantage, compatibility and trialability, combined with the lowest score on complexity. Retailers were most inclined to pay for same day delivery. The retailers stated that they desire services which cater to their current difficult financial position, or which alleviate the current unpleasant shopping conditions. **Analysis:** The majority of the retailers currently have no intention to adopt the sustainable services, since they see little advantages in using the services. The services were not compatible with existing activities, not easy to understand, not suitable to use in the future and not readily observable. The same day delivery service had the highest scores on the attributes.

Keywords: innovation, city logistics, sustainable services, incumbent

Table of contents

Introduction

Since the appearance of the groundbreaking Brundtland-report (1987), also known as: 'Our Common Future', by the World Commission on Environment and Development (WCED), detailing sustainable development (SD), a wide variety of research has been conducted towards this phenomenon. Sustainable development is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" ((WCED), 1987, p. 8). The Brundtland-report stated that the most important global environmental problems were the result of a large disparity in the world; wherein widespread poverty with inherent ecological catastrophes in large parts of the world opposed virtually unbridled and unsustainable consumption and production in other parts (WCED, 1987). Ever since this statement was made, awareness of the problems and the need for SD has increased (Bonini, 2011). In the process of SD, society has recognized companies as key players (Cannon, 1994; Elkington, 2001; Dunphy, Benn, & Griffiths, 2003). The challenge for any company is to "improve the quality of life today without compromising the quality of life of future generations" (Azapagic, 2003, p. 303). This requires a paradigm shift in the way policies are implemented as well as the way in which business is conducted (Hart, 1997). Companies need to focus on long-term survival (Elkington, 1997). In order to achieve this long-term survival, companies need to consistently appeal to the majority of customers in their targeted market. This is referred to as sustainable competitive advantage (Porter, 1985; Hall, 1993). Many companies however, currently struggle with achieving a sustainable competitive advantage through a lagging incorporation of sustainability within the organizational structure (Azapagic, 2003).

A major factor in both business survival and in achieving and sustaining the aforementioned sustainable competitive advantage, is innovation (Schumpeter, 1942; Lengnick-Hall, 1992). For the purpose of this thesis, innovation is defined as "an idea, practice, or object that is perceived as new by an individual or organization" (Rogers, 2002, p. 990). Businesses face many challenges, either when bringing new products and processes to the market, or when entering a new market. Therefore, a thorough understanding of the Product Life Cycle (PLC) is needed. The PLC details how sources of competitive advantage can change over time, whilst simultaneously visualizing how a company might effectively survive (Anderson & Zeithaml, 1984). For the continuous survival of a company innovation is key (Schumpeter, 1942). However, innovation inherently creates a great deal of uncertainty for companies due to the newness of innovative ideas (Rogers, 1995). The rate in which an innovative idea is, or is not, perceived as relevant by individuals, determines the rate of adoption. The attributes which determine the rate of adoption of an innovation are: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability and (5) observability (Rogers, 1995). Furthermore, Rogers (1995) emphasized that innovations are not adopted at the same speed and time by all individuals. Instead, Rogers (1995) proposed a classification consisting of five categories: innovators, early adopters, early majority, late majority and laggards.

In this thesis emphasis is placed on the incumbents, since innovation is vital to incumbents in order to maintain a competitive position whilst dealing with external changes such as new, emerging or disruptive technologies (Christensen, 1997). For the purpose of this thesis, incumbents are defined as large firms with more than 250 employees and a net turnover of more than 35 million Euros (Kvk, 2015). These firms react slowly to changes, and therefore rarely introduce innovations (Chandy & Tellis, 2000). Paradoxically, these incumbents do have large financial and technological capabilities, thereby creating a large potential for change (Chandy & Tellis, 2000).

This thesis focuses on a specific Dutch incumbent: PostNL, which is the largest private employer in the Netherlands, and holds control over a vast postal and logistical network (PostNL, 2015). For over 200 years, PostNL has distributed letters and packages in the Netherlands, the Benelux, the United Kingdom, Germany and Italy (PostNL, 2015). Due to rapid and significant changes in the postal market, e.g., decreasing volumes of physical mail, the emergence and rapid growth of e-commerce, and increasingly strict regulations regarding transportation within city centers, PostNL is in a position wherein innovation is needed in order to retain a dominant market position. PostNL aims to innovate within the boundaries of their mission. Their mission is (1) to be a flexible social organization within a shrinking and competitive market, (2) to minimize the impact of their products and processes on the environment, and (3) to contribute to the vitality of the societies within which they operate (PostNL, 2015). This has recently led to the creation of a new department: 'Stadslogistiek' or 'City Logistics' in Delft. City Logistics has the characteristics of a start-up, whilst functioning within an incumbent. City Logistics aims to provide a solution for the aforementioned challenges faced by PostNL through the creation of a logistical hub at the outskirts of the city of Delft, from which small electric vehicles provide flexible delivery and retrieval services which simultaneously have a minimal impact on the environment and quality of life. Therefore, PostNL is able to explore a new sustainable business model.

Five sustainable services have been designed by City Logistics, namely: (1) bundling of supplies, (2) same day delivery, (3) delivery on another day, (4) express delivery, and (5) collection of dry waste. The first sustainable service is bundling of supplies, which signifies that products from individual logistical companies are bundled at a centralized hub and supplied to the retailers at the desired time. For the purpose of this thesis, the term 'supply' is applied when products are transported from the manufacturers, to the store of the retailer. Second, by same day delivery is aimed at the delivery of products from the retailer to the customer on the same day. For the purpose of this thesis, the term 'delivered' is applied when a product is transported from the store of a retailer, to the customer. Third, by delivery on another day is aimed at the delivery of products from a retailer to the customer on a different day. Fourthly, express delivery is aimed at the delivery of products from a retailer to the customer within three hours. Fifth, and final, collection of dry waste is aimed at the collection of plastic and paper from the retailers, at the desired time.

Desirability of these sustainable services by the stakeholders needs to be explored. The main stakeholders of City Logistics are: (1) the retailers, (2) the municipality, (3) the transporters, and (4) the residents. This thesis will focus primarily on the retailers, since this group of stakeholders needs to adapt to changing market conditions in order to survive increased competition from national retailer chains and increased e-commerce. This characteristic, which is similar to the market conditions PostNL is facing, makes them highly suitable for a targeted and innovative approach by PostNL City Logistics. Retailers are simultaneously urged by the municipality to move towards increased sustainability, e.g., by the introduction of environmental zones and limiting the number of parking places within the city center (Ministry of Economic Affairs, 2015). Subsequently, retailers can urge other stakeholders to also adopt the five sustainable services, in order to further increase the movement towards increased sustainability.

Regarding the retailers currently present within the inner city of Delft and based on the aforementioned characteristics, the rate of adoption is hypothesized to increase when City Logistics provides quick, punctual and cheap collection and delivery services, at flexible hours. A possible contributing factor to the rate of adoption is the opportunity for retailers to generate an increasingly positive and 'green' image towards their customers by making use of services provided by City

Logistics. The designed sustainable services might satisfy one or more of the aforementioned conditions and it is hypothesized that by implementing one or more of these sustainable services a competitive advantage for PostNL could be achieved. In conclusion, this thesis aims to answer the following question:

Which sustainable services of City Logistics have the highest potential to be adopted by the retailers in Delft?

The scientific relevance of this research is in exploring whether Rogers´ (1995) theory of product innovation is suitable for application on service innovation, in situations wherein the product has not yet surpassed the developmental phase of the PLC and is therefore not yet available on the market. Applicability and relevance also stretches to a practical and business sense, by (1) using the results as input to further develop a new sustainable business model for retailers by using one or more of the sustainable services, and (2) decide whether this model is suited for implementation in other cities, thereby creating an opportunity for PostNL to retain its dominant market position.

The outline of this thesis is as follows: the leading theories regarding innovation are explored in the chapter 2, with a specific focus on the adoption of innovation. The context of city logistics and specifics regarding the case study are described in chapter 3. A description of the methodology is given in chapter 4. Chapter 5 shows the results from this study and, in chapter 6, the results are compared to the existing literature. The aforementioned research question is answered in chapter 7. Limitations of the current research project are explained in chapter 8. In conclusion, an advice to the company based on the results, is given in chapter 9.

Literature review

In a free market, each individual customer is free to choose the company of their liking to deliver the product/ and or service they desire. This choice is based on a variety of factors: e.g., price, specification, reliability, aesthetics, functionality and availability (Hall, 1993). These factors imply that the competitive advantage of a company exists in the eyes of the customers or, stated differently, if the company is able to consistently appeal to the majority of customers (Hall, 1993).

Product Life Cycle

The PLC reveals that sources of competitive advantage are subject to continuous change, and visualizes how a company might effectively survive in a setting where liability of newness (Singh, 1986), time pressure (Roure, 1990) and high uncertainty (Vaan, 2010) play a role. It demonstrates the evolution of a product in the respective industry over time (Teece, 1986), see figure 1. The PLC can be split into two stages, which can in turn be subdivided into two phases: the explorative stage can be subdivided into the development and take-off phases; the exploitative stage can be subdivided into the growth and maturity phases.

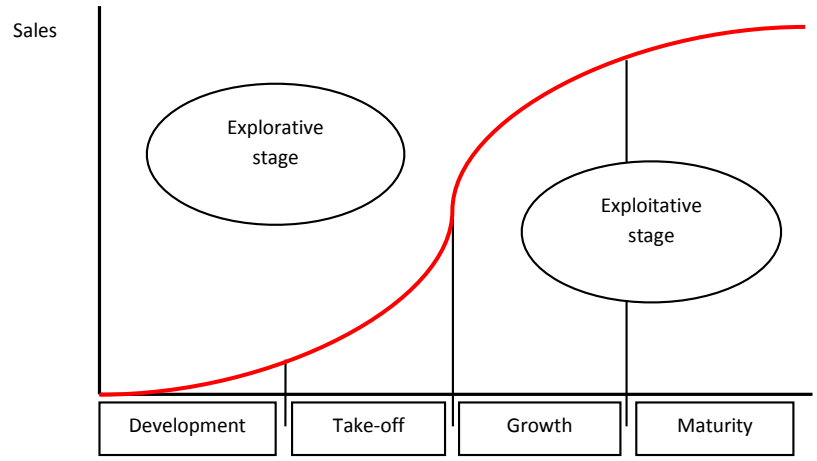

Figure 1 *The Product Life Cycle* (Teece, Pisano, & Shuen, 1997; Anderson & Tushman, 1990; Nooteboom, Van Haverbeke, Duysters, Gilsing, & van den Oord, 2007)

During the explorative stage, development of a product is characterized by high investment in Research and Development (R&D), with a strong focus on design and functionality. General knowledge building is needed in order to exploit a specific gap in the current market, or even to create a potential new market (Teece et al., 1997). When a product is developed and is ready for sale, the take-off phase has been reached. This is one of the critical periods in the PLC of a company, wherein high levels of differentiation between new and existing products lead to fierce competition (Anderson & Tushman, 1990). During this phase, companies work towards setting an 'industry standard': the dominant design. The ultimate arrival of this dominant design is a critical period in which companies can fail. After the process of standardization is completed, a massive shakeout of competitors occurs.

The existence of a new dominant design allows companies to compete on the optimization of organizational processes and efficiency, resulting in cost reductions (Abernathy, 1978). This is the

start of the exploitative stage, during which competition shifts from product innovation to process innovation (Utterback, 1993). This shift ultimately results in increased price competition and decreased product differentiation, in order to both maintain and increase market share (Porter, 1985). Therefore, the market share of the company that sets the dominant design increases, which is referred to as the growth phase. The fourth and final phase of the PLC has been dubbed the maturity phase, during which competition on product prices between the surviving companies is most important. As profit margins decline, two options emerge; either the PLC is heightened through the addition of new features which extend the cycle, or a new product is introduced which forms the start of a new PLC.

Adoption of innovation

The PLC demonstrates how companies can create the sustained competitive advantage necessary for survival (Lengnick-Hall, 1992). For the survival of a company innovation is key (Schumpeter, 1942). In this thesis, innovation is defined as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers, 2002, p. 990). Due to the newness of innovative ideas, individuals and/ or companies consequentially approach an innovation with a great deal of uncertainty (Rogers, 1995). The rate in which an innovative idea is, or is not, perceived as relevant by the individuals and/ or companies which comprise the social system, determines the rate of adoption. Rogers (1995) suggested that to be adopted, an innovation should be perceived as (1) offering a relative advantage (2) compatible with existing activities, (3) simple to use, (4) suitable for easy trial, and (5) readily observable, see figure 2. Research showed that the availability of these five attributes speed up the innovation process (Sahin, 2006), and influences the likelihood of adopting an innovation (Anderson, Varnhagen & Campbell, 1998; Bennett & Bennett, 2003). These five attributes are briefly explained underneath.

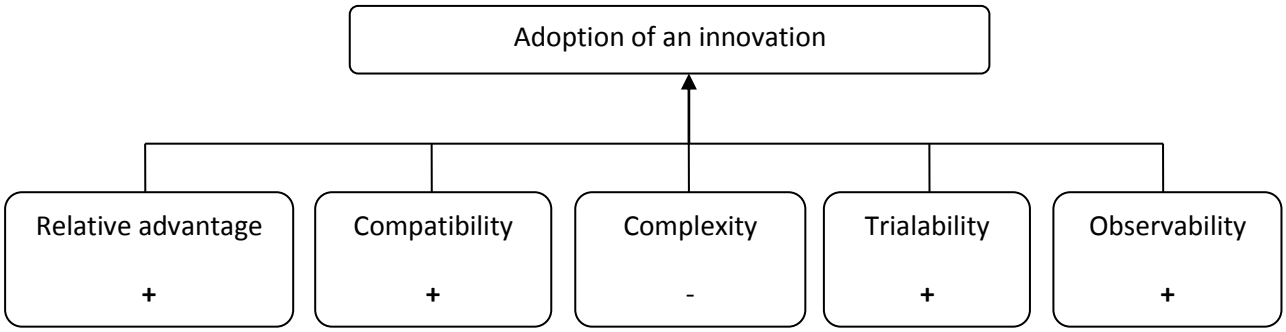

Figure 2 *The adoption of an innovation* (Rogers, 1995)

The first attribute is the relative advantage, which is the degree to which an innovation is better than the existing product or service (Rogers, 1995), e.g., the innovation enables customers to do something faster or cheaper. When an innovation is considered outstanding, the relative advantage is high and the rate of adoption will be high. However, when an innovation does not make a large difference with the existing products or services, the rate of adoption is likely to be low. In this case, people want to keep the old product or service that proved to function properly, instead of switching to the new innovative product or service. Previous literature has indicated that perceived relative advantage has a significant and positive influence on the adoption of innovations (Tornatzky & Klein, 1982; Holak & Lehmann, 1990; Tan & Teo, 2000; Slyke, 2001). Additionally, multiple studies revealed

that relative advantage function as as a powerful attribute, since it is plausible that customers often search for better and unique products and services which hold specific benefits over the existing product or service (Lefkoff-Hagius & Mason, 1993; Tambini, 1999; Ruyter, Wetzels, & Kleijnen, 2001). An example of relative advantage is the digital camera, which has been widely adopted. These camera's make it possible to, i.e. immediately see the photographic result, instead of first having to develop each individual photo. Additionally, the digital camera eliminates the costs and time of waiting on printed photos (Gunderman & Meesa, 2008). Aside from the potential practical advantages an innovation offers, other factors are also highly important, e.g., satisfaction, convenience and social prestige. In total, the relative advantage can be divided into six specifications, namely: (1) economic profitability, (2) low initial cost, (3) decreased discomfort, (4) social prestige, (5) savings in time and effort, and (6) immediacy of reward (Rogers, 1995). The type of relative advantage that is most important will vary, based on the nature of the innovation and the characteristics and values of the intended adopters (Rogers, 1995).

The second attribute, compatibility, describes the degree to which an innovation connects closely to the activities of the adopter (Rogers, 1995). The innovation should be compatible with the existing activities of the adopter, which results in a higher chance of adoption. When the compatibility of an innovation is low, the rate of adoption is likely to be low and it will therefore take a longer time for people to get used to it. According to Hoerup (2001), the compatibility of an innovation is significantly related to the adoption and implementation of the innovation. Additionally, previous research findings indicated that the perceived compatibility of an innovation has a positive influence on the adoption of the innovation (Cooper & Zmud, 1990; Tornatzky & Klein, 1982; Tan & Teo, 2000). An example of a service with high compatibility is the World Wide Web. Due to the ability to make use of the existing data-infrastructure, in combination with a high desire to rapid electronic communication, the internet was adopted at a much higher rate than e.g., the telephone (Gunderman & Meesa, 2008).

The third attribute is complexity, which is defined as the degree to which an innovation is easy to use (Rogers, 1995). The innovation should be simple to use in order to prevent adopters from being unable to understand how to use the innovation, and therefore not adopt it (Dickerson & Gentry, 1983; Moore, 1987). In the case of complexity, the values should be reversibly interpreted. Therefore, it can be stated that the lower the complexity, the higher the chance of adoption. A good example of low complexity innovation in daily life is Microsoft PowerPoint, which is relatively easy to understand. Nearly everyone is able to sit down and create a presentation (Gunderman & Meesa, 2008).

Trialability, the fourth attribute, details the degree to which an innovation may be experimented with on a limited base (Rogers, 1995). The more an innovation is available for trial, the faster the adoption of the innovation (Sahin, 2006). For example, the ability to take a test drive in a car will increase the chance of adoption, compared to buying a car on the internet.

Finally, observability, the fifth attribute, describes the extent to which potential customers see other individuals using the innovative product (Rogers, 1995). When many people use an innovation, allowing the advantages of a product to become visible, individuals can easily be convinced that the innovation should be adopted. When it is difficult to see the advantages of the new product, an individual is more inclined to stay with the old version. According to Slyke (2001), a significant relation was found between observability and the adoption of an innovation. An example is the marketing of the Nintendo video game system, wherein games were first visible and demonstrated in retail stores, allowing young customers to see other children playing them

(Gunderman & Meesa, 2008). The chance of adoption is likely to be higher, since the individual was able to observe the innovation while someone else was using it.

In conclusion, when all attributes are as high as possible, except for complexity which needs to be reversibly interpreted, the rate of adoption of an innovation is positively influenced. When the rate of adoption of an innovation is high, the competitive advantage of the responsible company will also increase.

Conceptual model

The existing literature concerning Rogers' (1995) theory of adoption, often focuses on product innovation, e.g., the mobile phone. Application of Rogers' (1995) theory to service innovation has been used far less often (Ruyter, Wetzels, & Kleijnen, 2001). However, in the current study emphasis is placed on innovation of services, which have not yet surpassed the early phase(s) of the PLC . Corresponding with the early stage of the innovation, the services have not yet been fully introduced on the market. This has direct consequences on the ability to adhere to the original definition of observability and trialability, as described in the adoption theory of Rogers (1995). Following Maitland & Bauer's (2001) proposition, both attributes were categorized as objective attributes for the purpose of the current study. In order to allow for a certain degree of measurement of both attributes, respondents were asked for (1) familiarity with City Logistics and if (2) they were interested in testing the newly developed services. In line with Maitland & Bauer's (2001) proposition, previous research findings have indicated that relative advantage, compatibility and complexity have the most consistent relation with the adoption of an innovation (Wyner, 1974; Holloway, 1977; Tornatzky & Klein, 1982).

In adherence to the aforementioned research findings, a new conceptual model was created in order to investigate the potential relation between relative advantage, compatibility and complexity as independent variables, and a new dependent variable; the willingness to pay for usage of the services. Claudy, Michelsen, & O'Driscoll (2011) have recently positively tested this conceptual model, using these specific attributes and their respective positive or negative relation to willingness to pay. For a visual representation of the model, see figure 3.

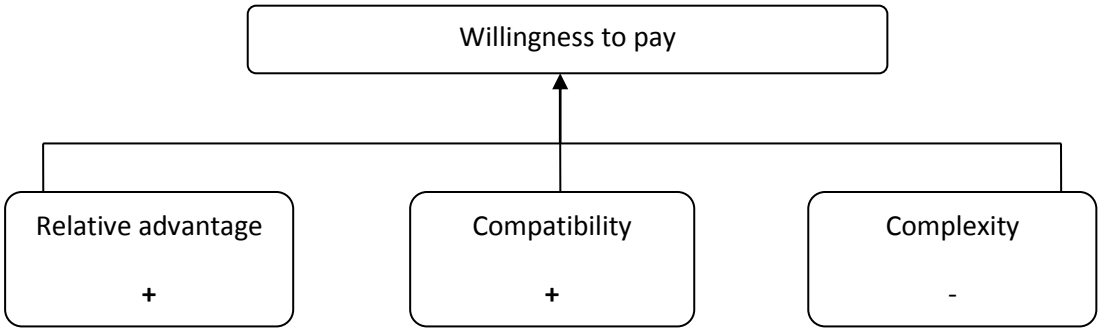

Figure 3 *Willingness to pay, a conceptual model*

In line with the model as proposed by Rogers (1995), it is hypothesized that higher levels of both relative advantage and compatibility, result in a higher level of willingness to pay. Complexity is the exact opposite, due to the need for an inverse interpretation. This leads to the following three hypotheses:

Hypothesis 1: The higher the level of relative advantage, the higher the level of willingness to pay.
Hypothesis 2: The higher the level of compatibility, the higher the level of willingness to pay.
Hypothesis 3: The lower the level of complexity, the higher the level of willingness to pay.

Adopter categories

Innovations are not adapted by all individuals in a social system at the same time. Instead, it can be classified into adopter categories based upon the degree to which an individual is relatively early or late in adopting a new product or service (Mahajan, Muller, & Srivastava, 1990). According to Rogers (1995), five adopter categories exist: (1) the innovators, (2) early adopters, (3) early majority, (4) late majority and (5) laggards, see figure 4.

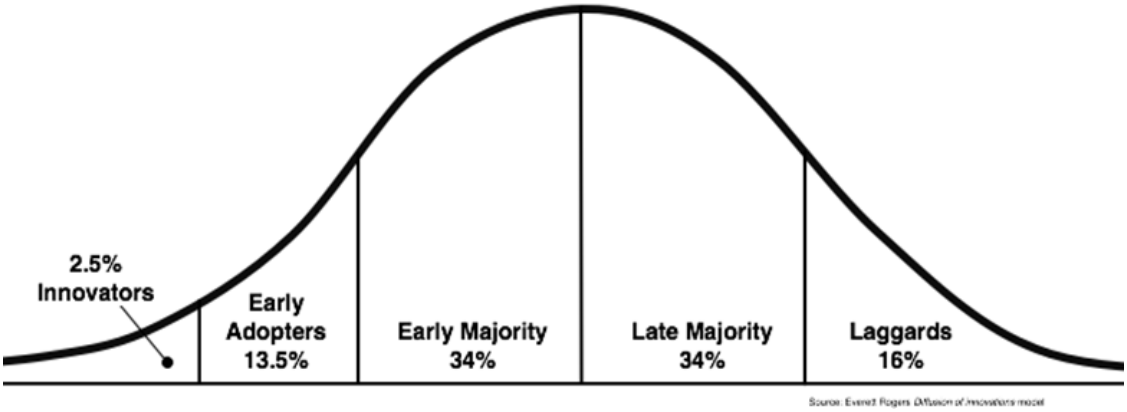

Figure 4 *The adopter categories as proposed by Rogers* (1995)

'Innovators' are the first 2.5% of individuals in a social system to adopt an innovation, they are considered to be the first to try the newly developed and introduced innovation. Innovators are venturesome and highly interested in new ideas. They are willing to take risks, and are often the first to develop new ideas (Rogers, 1995). The second category consists of 'early adopters': the next 13,5% of the individuals in a system to adopt an innovation. Early adopters often represent opinion leaders, who are aware of the need to change and feel comfortable with the adoption of new ideas (Rogers, 1995). The third group has been termed 'the early majority', consisting of the next 34% of individuals. The early majority are in need of compelling evidence and success stories regarding the feasibility of the innovation, before they are willing to adopt it. However, they do belong to the group of individuals who adopt the innovation on average faster than individuals belonging to the final two categories. Fourthly, the 'late majority' consists of individuals with skepticism towards change and who will only adopt an innovation after the majority of the people has already done so (Rogers, 1995). Finally, the 'laggards' are the final 16% of individuals who are highly conservative and bound to tradition. They are skeptical of change and will only accept new ideas when surrounded by people who have already adopted the innovation and expressed their satisfaction. Therefore, laggards are the hardest group to convince to adopt an innovation (Rogers, 1995). In this study, it is expected that a minority of retailers will be positive about the services, since the services have not yet surpassed the early phase of the PLC. This minority of retailers could be referred to as innovators.

City logistics context

According to the European Commission (2014), around 80% of the citizens in Europe are expected to live in or near a city by 2020. This creates a large amount of movement in and around these cities, such as freight transport and passenger transport. Urban freight transport plays an important role in sustaining urban areas (Quak, 2008). Urbanization implies that people live closely together in a place which is increasingly distant from their resources, such as food and waste disposal (Ogden, 1992). The transportation of goods and services within the urban environment is fundamental to economic vitality (Allen, Anderson, Browne, & Jones, 2000) and indispensable for industrial, trade and leisurely activities. The distribution of goods in a rapid and reliable way supports the urban lifestyles, such as retailing and tourism (Allen et al., 2003). An efficient distribution system is key for the competitiveness of an urban area and therefore influences the urban economy (Browne & Allen, 1999). However, urban freight transport has many unsustainable impacts (Quak, 2008).

The current levels of urbanization lead to increasing city populations, thereby further boosting the need for transportation within the expanding urban areas (Chan & Yao, 2008). This has a direct link to the increase in CO_2 emissions, whilst also increasing concentrations of other pollutants such as nitrogen oxide (NOx) and carbon monoxide (CO) (Quak, 2008). These pollutants have severe psychical health consequences for the city's inhabitants (Quak, 2008). The increased demand for transportation results in an increase in the use of non-renewable natural resources, e.g., fossil fuels, whilst simultaneously increasing the amount of waste products (tires, oil, etc.) (Quak, 2008). This increase of urban freight transport results in increased noise disturbance, and more traffic accidents resulting in injuries or death. Due to the high amount of transport in the urban area, the accessibility of a city decreases and congestion increases. The rising need for expanding infrastructure leads to a loss of greenfield sites within the city, thereby further decreasing city attractiveness. All these factors combined result in a decrease in reliability and delivery punctuality, which in turn results in decreased service to consumers and lost market potential (Quak, 2008).

In the present situation, a logistical company aims to supply a product as soon as possible after an order is received, see figure 5. Each received order is treated as a separate one, leading to multiple trips into the city. Following delivery, the vehicle used by the logistical company often has an empty cargo hold during the return trip, leaving room for improved efficiency. The primary purpose of the logistical company is to deliver and retrieve as many packages as possible, whilst the amount of distance covered is secondary. In this situation, the 'sending customer' is in charge. Therefore, it can be concluded that the focus is currently on achieving the most efficient way of logistical transport, based on the sending customer.

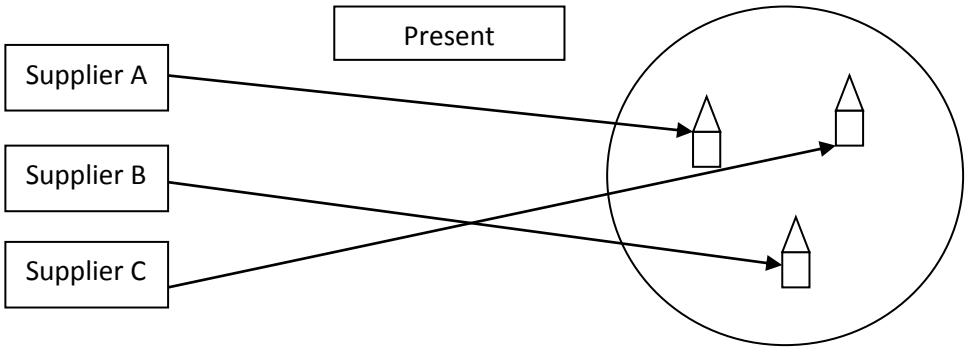

Figure 5 *The present situation of the logistical transportation in a city*

The present situation however, is unable to function as effectively within city centers. The inner part of a city is characterized by a dense population and highly developed areas, leaving little room for vehicle maneuvering. This ultimately leads to the 'last mile transportation' being the most costly (Gevaers, 2009), making it highly suitable for a targeted innovative approach.

Case study

The city of Delft envisions an environmental zone which is void of pollutant emissions, in order to create a pleasant and clean living environment which is simultaneously attractive for the shopping public and tourists (Ministery of Economic Affairs, 2014). However, due to the rapid growth of e-commerce - among others -, levels of pollutant emissions within the municipality are increasing. To achieve the ambitious goal of zero emission of greenhouse gasses within the municipal area, the municipality has signed the 'Green Deal Zero Emission Stadslogistiek' (Ministery of Economic Affairs, 2014). This Green Deal is a partnership between politics and business, aimed at the development of new forms of transportation services which do not emit greenhouse gasses by means of 'Stadslogistiek', in order to achieve safer and cleaner inner cities in 2025 (Ministery of Economic Affairs, 2014). The term 'Stadslogistiek' refers to the provision of a 'function to supply the inner city, combined with the simultaneous retrieval of waste products, packaging materials and goods, achieved through the use of 'clean' vehicles (same or lower than Euro VI/6) owned by logistical service providers and/ or private vehicles (including those owned by the municipality itself), within the limits of national and municipal laws and regulations' (Ministery of Economic Affairs, 2014). The concept of city logistics has been introduced in 1992 by Ogden. Several studies have been published on city logistics and many concepts were tested around the world. However, it has not been developed yet in a proven business case. In order to execute 'Stadslogistiek', living labs have been introduced, which function as temporary experiments within a city, aimed at studying the organizational, technological, social, financial and legal adjustments required in order to achieve zero emission city logistics. However, municipalities are dependent on the cooperation of other parties, such as PostNL, in order to maintain current levels of transportation services to its inhabitants (Ministery of Economic Affairs, 2014).

An example of one of the aforementioned living labs is City Logistics Delft, which is a partnership of the new department of PostNL and the municipality of Delft. The team currently consists of twenty people, of which twelve are charged with the distribution and collection of goods. City Logistics Delft operates on a municipal level and aims to provide flexible delivery services, combined with the exertion of a minimal impact on the quality of life in a city and the environment. In order to achieve the aforementioned goals, a logistical hub has been installed near the A13

highway on the outskirts of the city, from which small electric vehicles which amply meet the standards set by Euro VI/6, deliver and collect goods (Ministery of Economic Affairs, 2014), see figure 6. These vehicles run at a maximum speed of 27 km/hour, which brings with it the important advantage of being legally allowed to drive on cycling paths, including those within the inner city. Through the use of this logistical hub, a new situation is created in which several sustainable services are explored. In addition, the new services will shift the focus placed on the most efficient logistical transport based on the sending customer, towards a model in which the focus is placed on generating the most customer value, wherein the receiving customer is in charge. Ultimately, City Logistics aims to develop a new sustainable business model.

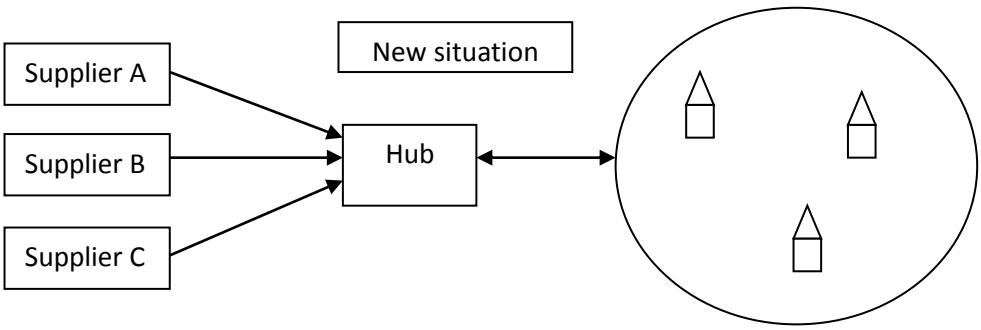

Figure 6 *The new situation created by PostNL City Logistics*

Methodology

This study is divided into four phases and will be conducted at PostNL City Logistics Delft.

Phase 1 Description and selection of study participants

A systematic overview of the retailers present within the inner city of Delft (ZIP codes 2611 and 2612) was made in April 2015 through the use of 'Google Maps'. In order to verify that no retailers were missed, a physical check was conducted. A total of 590 retailers were found to be present within the study area. Of each of these retailers, the address, branch, website, webshop, delivery service, social media presence and implementation of corporate social responsibility were digitally collected in an Excel table.

Study participants were chosen randomly from the retailers present within the inner city through use of a random number generator (Random, 2015), which provided each individual retailer with a mathematically equal chance at participation. In this research 143 participants were selected, with a confidence level of 95% and a confidence interval of 7 (Survey system, 2015).

Phase 2 Development of the questionnaire

A questionnaire was developed in order to obtain standardized information from the retailers. A major advantage of using questionnaires is the ability for distribution to a large group, at relatively little time investment. A second advantage is the fast analysis due to the standardized responses, making questionnaires a relatively cheap and easy method to obtain data from a large group of respondents (Leary, 2008). In addition, questionnaires can be anonymized allowing participants to give more honest answers than in interviews (Leary, 2008). Prior to phase 3, the questionnaire was presented to 10 retailers in order to verify validity, and to provide insight into changes necessary before wider application. This resulted in small changes in the phrasing of several questions; no large changes were necessary.

In the questionnaire the aforementioned five sustainable service (bundling of supplies, same day delivery, delivery on another day, express delivery and collection of dry waste) were discussed, see appendix A. For each sustainable service, the questionnaire asked the opinion of the retailer regarding: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability. This allowed for incorporation of the five attributes of the rate of adoption of an innovation as set by Rogers (1995), within the questionnaire. Next, the specifications of the relative advantage and complexity were asked. In addition, general questions on the satisfaction of the current supply, the amount of supplies per week, the hinder of supplies, webshop, potential usage and the willingness to pay were asked. The questionnaire mainly consisted of multiple choice questions with a five point Likert scale, with answer categories varying from 'completely disagree', to 'completely agree'. Questions regarding specification of the relative advantage for adoption, offered a number of options based on Rogers' theory (1995). Questions regarding specification of barriers for adoption, offered a number of options based on internally available documents (Rademakers, 2014). After the final question, retailers were offered room to specify other services they desire, using an open-ended question.

Phase 3 Conducting the questionnaire

The researcher visited the selected retailers and asked for the manager, who was then asked to participate in the study and complete the questionnaire. The researcher remained present during

completion of the questionnaire, in order to answer any questions or to offer clarification. After completion, the researcher verified whether all questions were completed and if any answers required further clarification.

When the manager or entrepreneur of the store was unavailable, the researcher returned when it suited the retailer best. In situations where the manager refused to cooperate, when a new appointment was impossible or when the manager was unavailable after three subsequent visits, a new retailer from the list was randomly chosen using the random number generator.

In addition, to increase the amount of respondents the questionnaire was send via e-mail to the remaining retailers, which had taken into account the fact that not all retailers had a known e-mail address.

Phase 4 Data analysis

Statistical analysis of the data was performed using SPSS, version 22.0 (IBM Corp., 2013). Firstly, background information of the respondents were given in n (%), e.g., sector, gender, age and educational level. In addition, a distribution of the industry classification in the inner city of Delft was compared with the distribution of the sample to explore representability of the sample. Descriptive results were given for: satisfaction with the current supply, amount of deliveries per week, hinder to work, webshop and usage in the future.

The mean scores of the five attributes of Rogers' theory (1995) were investigated for each of the sustainable services, in order to explore the adoption of innovation. Due to the aforementioned reasons, mean scores could not be computed for the attribute observability.

Each respondent gave his/her opinion on the five sustainable services in the questionnaire, allowing for the creation of three or more groups. Data was, therefore, considered as statistically paired data. All questions on the sustainable services used the same scale from 1 (strongly disagree) to 5 (strongly agree). Not applicable was added as an extra answer category.

In order to investigate the relative advantage, firstly, an overview of the scores per sustainable service and per specification were given. Subsequently, it was investigated whether the specifications could be considered as a single factor. Therefore, data was assessed using a factorial analysis. In addition, to investigate whether the scale was reliable, all scales were assessed using chronbach's alpha. A chronbach's alpha coefficient of > 0.7 was considered reliable (Nunnally & Bernstein, 1978). To investigate whether a significant difference existed between the five services, one-way repeated measures ANOVA's were conducted. One-way repeated measures ANOVA's allow for the comparison of respondents' responses on multiple items within a questionnaire, when the prerequisite of a similar, interval-based answer scale is fulfilled (Pallant, 2007; McCrum-Gardner, 2008). A p-value of < 0.05 was considered statistically significant. A similar method was used for the attribute complexity.

In order to investigate the compatibility, an overview of the scores per sustainable services were given. To investigate whether a significant difference existed between the five services, one-way repeated measures ANOVA's were conducted. One-way repeated measures ANOVA's allow for the comparison of respondents' responses on multiple items within a questionnaire, when the prerequisite of a similar, interval-based answer scale is fulfilled (Pallant, 2007; McCrum-Gardner, 2008). A p-value of < 0.05 was considered statistically significant. A similar method was used for the attribute trialability.

In order to statistically investigate the newly developed conceptual model, willingness to pay was operationalized as a dependent, binary variable; either retailers were, or were not, willing to pay

for the services. Each positive result from the questionnaire was therefore merged into this single dependent variable.

To verify that the potential relation between the dependent (willingness to pay) and independent (relative advantage, compatibility and complexity) variables were not influenced by other variables, data was controlled for confounding influences which potentially stem from the gender, age and industry classification distribution of the retailers. This technique is often used in statistical analysis, e.g., Courtemanche et al., 2011. Since industry classification was measured using a nominal scale, a dummy variable was created to allow for valid statistical analysis. A logistical regression analysis was conducted to investigate the potential relation between the dependent, independent and control variables (Peng, Lee, & Ingersoll, 2002). A p-value of < 0.10 was considered statistically significant, due to the relatively low number of respondents.

The variables were operationalized in an operationalization table, see table 1. The questionnaire is given in Appendix A.

Table 1. *Operationalization table*

	Specifications	**Question**	**Measurement**
Dependent variable			
Willingness to pay		22	How much are you willing to pay? (not/<€1/€1-€2/€3-€4/€5-€6/>€6)
Independent variable			
Relative advantage	-Economic profitability -Low initial cost -Decreased discomfort -Social prestige -Savings in time and effort -Immediacy of reward	16, 17, 18, 19, 20	To what extent do the following aspects contribute to your business for each service? (Likert scale: strongly disagree – strongly agree / not applicable)
Compatibility		21	To what extent do the services connects to your current activities? (Likert scale: strongly disagree – strongly agree)
Complexity	-Price -Quantity -Not supplied/delivered -Not supplied/delivered in time -Incorrect supplied/delivered -No need from my clients -Nationally arranged -High risk product	23, 24, 25, 26, 27	To what extend are the following aspects a barrier to your business for each service? (Likert scale: strongly disagree – strongly agree / not applicable)
Control variables			
Industry classification		2	In what industry classification

		does your business belong? (business service, retail, healthcare, hospitality, construction, other)
Gender	3	What is your gender? (male/female)
Age	4	What is your age? (<20/ 20-30/ 31-40/ 41-50/ 51-60/ 61-70/ >70)
Variables		
Trialability	28	Are you interested in a pilot phase of (one of) the services? (Likert scale: strongly disagree – strongly agree / not applicable)
Observability	6, 7	Are you familiar with City Logistics Delft? (No/Yes) How did you become familiar with City Logistics Delft? (newspaper/ via other retailers/ internet/ small electric vehicles/ electric bicycles/ other, namely/ not applicable)

Data preparation

The inner city of Delft contained 590 distinguishable retailers during the study period. Of these 590 retailers, 184 were visited psychically: 141 respondents expressed their intention to participate in the study, whilst 43 retailers did not want to participate. Reasons for not participating were: no time, which related to the wrong time of the day, manager was not present, or the store was closed. In order to increase the total number of participating retailers, and related to the time-consuming nature of the psychical visits, an e-mail was sent to an additional 167 retailers. E-mail addresses of the remaining 239 retailers could not be obtained. The mailing resulted in an additional 2 retailers who expressed their intention to participate in the study; the remaining 165 retailers did not respond. Overall, a total of N = 143 retailers participated in the study.

Of these 143 participants, n = 77 (53.8%) were male and n = 66 (46,2%) were female. Nearly one third of the respondents was 51 - 60 years old (31.5%), closely followed by the category of 41 - 50 years old (30.1%), 31 – 40 years old (22.4%), 20 – 31 years old (13.3) and 61 – 70 years old (2.8%). The educational level of the largest group of respondents is 'MBO'[1] (40.6%), followed closely by 'HBO'[2] or University (27,3%), 'VMBO'[3] (17.5%), 'HAVO/ VWO'[4] (10.5%) and none, primary education or elementary education (4.2%). Finally, the vast majority (79.7%) of respondents belonged to the retail sector, see figure 7.

[1] MBO means Intermediate Vocational Educational.
[2] HBO means University of Professional Education.
[3] VMBO means preparatory middle-level applied education.
[4] HAVO/ VWO means higher general continued education/ preparatory scholarly education.

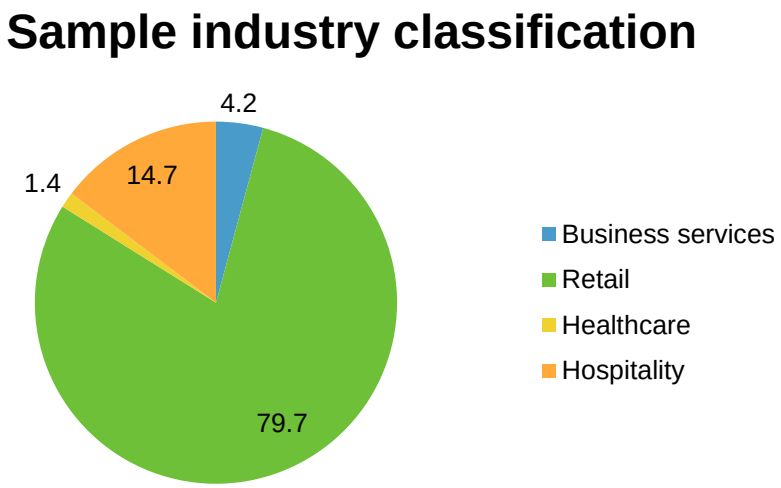

Figure 7 *Industry classification of the sample study*

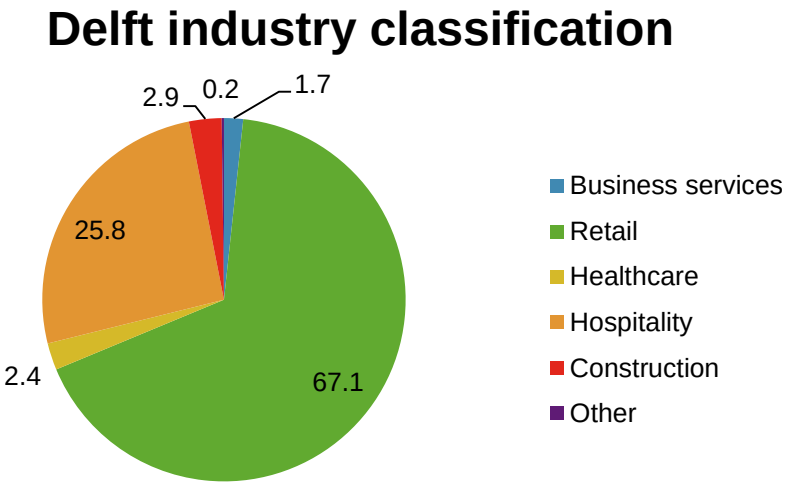

Figure 8 *Industry classification of Delft* (CBS, 2015)

When the industry classification of Delft (figure 8) is compared with the sample study (figure 7), it can be concluded that the major part of the figure is allocated to the retail industry. Regarding hospitality, a larger part of the figure was allocated to the industry classification, when compared to the sample study. Due to the selection made using the random number generator, the construction industry was not included in the sample of Delft.

Aside from the aforementioned industry classifications, data was prepared in order to make a valid comparison between the five attributes of Rogers (1995). Two of these attributes, namely: relative advantage and complexity, consisted of more than a single specification. In order to allow for a valid comparison, these were bundled into individual and overarching components, depending on the loading factor. According to Field (2009), a loading factor of 0.512 is used when the sample size is 100. In line with the suggestions made by Field (2009) for deviating sample sizes, a loading factor of 0.5 was chosen, based on the total N = 143.

Inspection of the correlation matrix of the attribute relative advantage, revealed the presence of many coefficients of 0.5 and above. The Kaiser-Meyer-Oklin value was 0.855 (bundling of

supplies), 0,872 (same day delivery), 0.860 (delivery on another day), 0.885 (express delivery), and 0.878 (collection of dry waste), thereby exceeding the recommended value of 0.6 (Kaiser, 1974). The Bartlett's Test of Sphericity (Bartlett, 1954) reached statistical significance ($p < 0.001$), supporting the factorability of the correlation matrix, see appendix C.

Inspection of the correlation matrix of the attribute complexity, revealed the presence of many coefficients of 0.5 and above. The Kaiser-Meyer-Oklin value and the Bartlett's Test of Sphericity (Barlett, 1954) were not given in SPSS. Due to the lack of this data, statistical significance could not be concluded, which is required to support the factorability of the correlation matrix.

Principal component analysis of the attribute relative advantage, revealed the presence of one component with Eigenvalues exceeding 1, explaining 75.345% (bundling of supplies), 86.015% (same day delivery), 87.398% (delivery on another day), 87.755% (express delivery), 90.928% (collection of dry waste) of the variance respectively, see appendix C. The specifications of the attribute relative advantage, allowed for interpretation of the attribute as a single component.

Principal component analysis of the attribute complexity, revealed the presence of two components on three services, namely: same day delivery, delivery on a different day and express delivery, with Eigenvalues exceeding 1, explaining same day delivery with 55.790% and 14.823%, delivery on another day with 54.997% and 13.067%, and express delivery with 54.942% and 12.543% of the variance respectively. Two services, namely bundling of supplies and collection of dry waste, could not be taken into account due to the large amount of missing values. Inspection of the screeplot revealed a clear break after the second component, see appendix E. Using Cattell's (1966) scree test, it was decided to retain two components for further investigation. The first component was dubbed 'supplies/ deliveries' and includes the specifications: 'price', 'quantity', 'not supplied/ delivered', 'not supplied/ delivered in time', 'incorrectly supplied/ delivered' and 'high risk product'. The second component was dubbed external factors and includes the specifications 'nationally arranged' and 'no need from my clients'.

In addition, reliability of the scales was investigated using chronbach's alpha. A Chronbach's alpha of > 0.7 was considered reliable (Nunnally & Bernstein, 1978). The Chronebach's alpha coefficient of the attribute relative advantage was 0.923 (bundling of supplies), 0.963 (same day delivery), 0.968 (delivery on another day), 0.969 (express delivery), and 0.978 (collection of dry waste), see appendix C. The scale of all services on relative advantage can be considered to be reliable. The Chronebach's alpha coefficient of the attribute complexity was 0.734 (bundling of supplies), 0.851 (same day delivery), 0.848 (delivery on another day), 0.855 (express delivery), and 0.435 (collection of dry waste), see appendix E. These results imply that the scale of four of the services on complexity were reliable, whilst one service, collection of dry waste, was unreliable.

For the attribute complexity, specifications were selected from internally available documents (Rademakers, 2014), in order to gain a better understanding of the reason why it posed a barrier to the respondents. The following barriers were selected: price, quantity, not supplied/ delivered, not supplied/ delivered in time, incorrect supplied/ delivered, no need from my clients, nationally arranged and high risk product.

Results

In this chapter the results from the questionnaire are presented, including descriptive statistics, willingness to pay, attributes and other services desired by the retailers.

Descriptive statistics

In order to gain a clear understanding of the present supply and delivery situation of the retailers, including their respective (dis)satisfaction, several questions were asked, e.g., satisfaction of the current supplies and deliveries, the number of times deliveries were made to the store per week, potential hinder of these deliveries and if the retailer had a webshop aside from their physical store. The largest amount of respondents, 79.0%, were very satisfied with their current supply and delivery situation, see appendix B. The majority of respondents (30.8%) were supplied with their products one to two times a week, see figure 9.

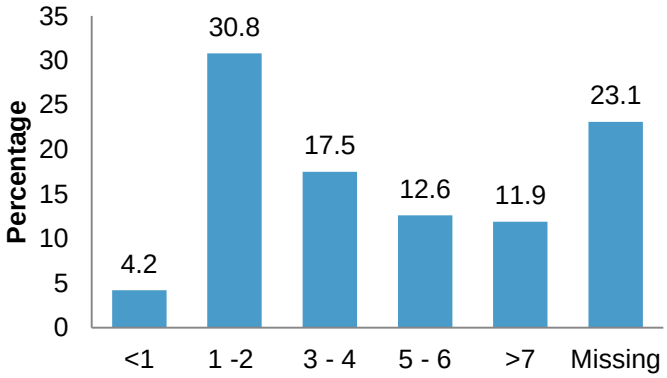

Figure 9 *Amount of deliveries per week*

Subsequently, around 34% of the respondents never experienced more supplies on one day as a hinder, as shown in figure 10.

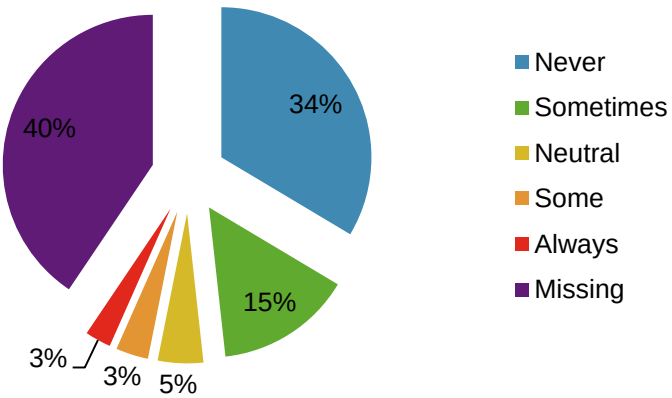

Figure 10 *Potential hinder of these deliveries in percentages*

There were approximately the same amount of respondents with a webshop (49.0%) as without one (51.0%). Finally, 30.1% of the respondents indicated neutrality towards the use of City Logistics in the

future, followed by 24.5% who had no intention of using City Logistics at all, see figure 11. Just over a quarter of respondents (25.9%) would like to use one or more of the sustainable services of City Logistics in the future.

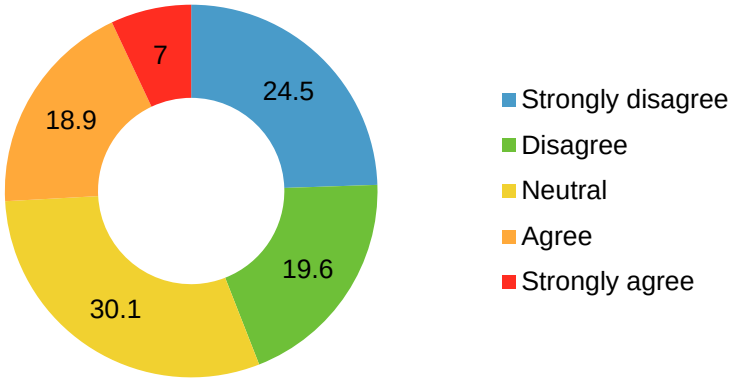

Figure 11 *Percentages of the potential future usage of City Logistics*

Willingness to pay

In order to give a good impression of whether the respondents would be willing to pay for any of the five services, this question was included within the questionnaire. As can be observed from figure 12, respondents showed very little intention of paying for these services, see appendix G.

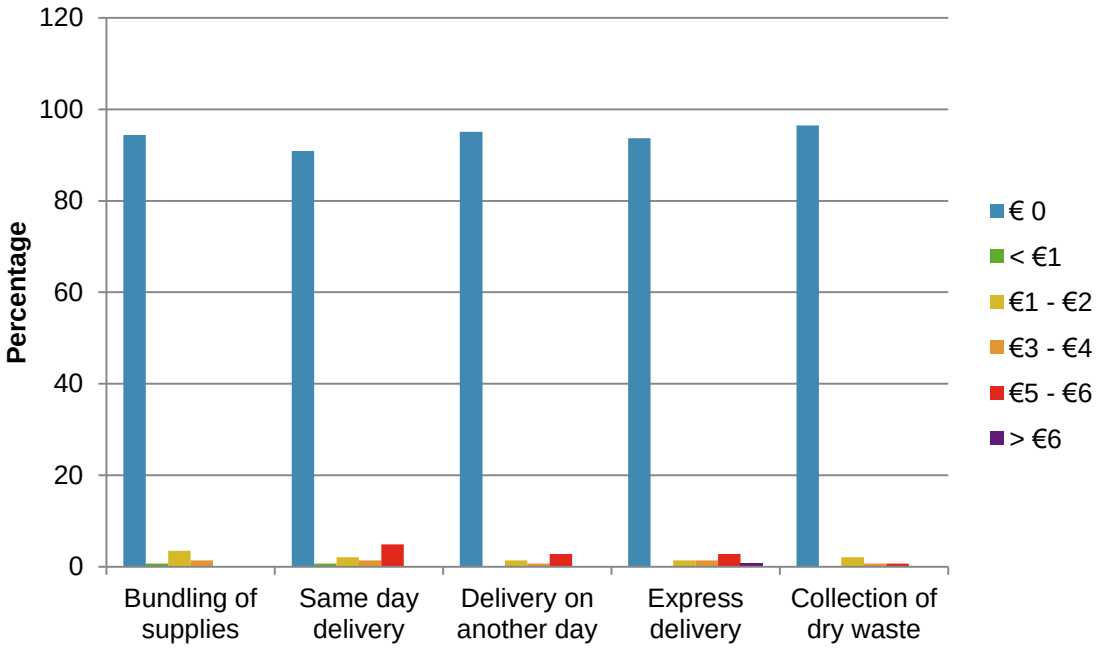

Figure 12 *Percentage of the sustainable services on 'willingness to pay'*

The willingness to pay was split into a binary variable, consisting of two categories wherein respondents were either willing, or not willing to pay for the sustainable services. As can be observed from table 2, the percentage of respondents who are willing to pay are low.

Table 2 *The percentages of respondents who are (not) willing to pay*

	Bundling of supplies	Same day delivery	Delivery on another day	Express delivery	Collection of dry waste
Not willing to pay	94,4	90,9	95,1	93,7	96,5
Willing to pay	5,6	9,1	4,9	6,3	3,5
	100	100	100	100	100

Relative advantage

Firstly, an overview of the sustainable services per specification of the attribute relative advantage is given, see figure 13. The specifications were given a score, ranging from 1 (strongly disagree) to 5 (strongly agree) on each service.

Figure 13 *Mean scores of the specifications of relative advantage*

As can be derived from figure 13, all sustainable services had a mean score of < 3 (neutral). Therefore, the respondents were generally negative about the services, see appendix C. It can be observed that the service of express delivery obtained the highest scores on all specifications, whilst the collection of dry waste obtained lower scores on all specifications compared to the other services. Social prestige had the highest score on each sustainable service, whereas low initial cost was indicated as the lowest specification on all services.

A one-way repeated measures ANOVA was conducted to compare scores on the relative advantage at bundling of supplies, same day delivery, delivery on another day, express delivery and collection of dry waste, N = 97, due to missing values. Means and standard deviations are presented in table 1. A significant effect was found for relative advantage ($p < 0.001$), Wilks' Lambda = 0.750, $F(4, 93) = 7.751$, and multivariate partial eta squared = 0.250.

Table 3 *Relative advantage for the five sustainable services*

	Mean	Std. Deviation
Bundling of supplies	2.471	0.828
Same day delivery	2.679	1.008
Delivery on another day	2.629	1.003
Express delivery	2.662	1.020
Collection of dry waste	2.103	0.983

Table 3 details the averagely neutral-to-negative attitude from retailers towards each of the five sustainable services. Same day delivery yielded the highest mean score (2.679), although it did not exceed mean neutrality. Collection of dry waste yielded the lowest mean score (2.103), indicating a relatively negative attitude when compared with the four other concepts.

Table 4 details a highly significant difference between collection of dry waste (5) – bundling of supplies (1), collection of dry waste (5) – same day delivery (2), collection of dry waste (5) – delivery on another day (3) and collection of dry waste (5) – express delivery (4), all with p-value's (far) below 0.05.

Table 4 *Relative advantage pairwise comparisons*

Service	Other services	Mean difference	Std. Error	Sig.
Collection of dry waste	Bundling of supplies	-0.368**	0.103	0.006
	Same day delivery	-0.576***	0.104	<0.001
	Delivery on another day	-0.526***	0.103	<0.001
	Express delivery	-0.558***	0.107	<0.001

Note. *p < 0.10; **p < 0.05; ***p < 0.01; ****p < 0.001.

The significant difference between collection of dry waste (5) – bundling of supplies (1), collection of dry waste (5) – same day delivery (2), collection of dry waste (5) – delivery on another day (3) and collection of dry waste (5) – express delivery (4), implied that service 5, collection of dry waste, had a significant lower relative advantage than the other four services, see appendix C.

Compatibility

An overview of the sustainable services of the attribute compatibility, is given in figure 14. The services were given a score, ranging from 1 (strongly disagree) to 5 (strongly agree) on each concept. As can be deduced from the figure, all services yielded a high score on 'strongly disagree', see appendix D for more detail. The respondents indicated that the services did not connect well with their activities. Especially, the service of dry waste collection was highly incompatible with the retailers (73.4%,). The answer options: 'neutral', 'agree' and 'strongly agree', each had very low scores, implying that few respondents indicated any of these services as compatible with their daily activities.

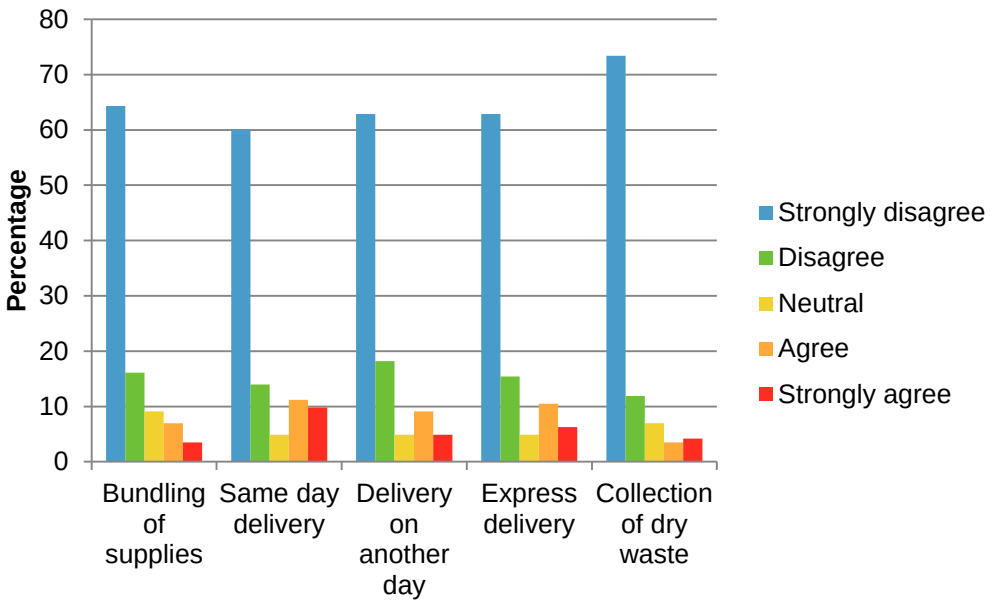

Figure 14 *Percentage of the sustainable services on compatibility*

A one-way repeated measures ANOVA was conducted in order to compare scores on the compatibility at 'bundling of supplies', 'same day delivery', 'delivery on another day', 'express delivery' and 'collection of dry waste' (N = 143). Means and standard deviations are presented in table 3. A significant effect was found for compatibility (p = 0.002), Wilks'Lambda = 0.889, F (4, 139) = 4.334 and multivariate partial eta squared = 0.111.

Table 5 *Compatibility for the five sustainable services*

	Mean	**Std. Deviation**
Bundling of supplies	1.690	1.115
Same day delivery	1.970	1.411
Delivery on another day	1.750	1.195
Express delivery	1.820	1.282
Collection of dry waste	1.530	1.054

Table 5 details the averagely negative-to-strongly negative attitude from retailers towards each of the five sustainable services. 'Same day delivery' yielded the highest mean score (1.970), although it did not exceed mean neutrality. 'Collection of dry waste' yielded the lowest mean score (1.530), indicating a negative attitude when compared with the four other services.

Table 6 details a highly significant difference between same day delivery (2) – delivery on another day (3), same day delivery (2) – express delivery (4) and same day delivery (2) – collection of dry waste (5), all with p-value's < 0.05. Therefore, it can be concluded that the respondents had highly different opinions about these services concerning compatibility, see appendix D.

Table 6 *Compatibility pairwise comparisons*

Service	Other services	Mean difference	Std. Error	Sig.
Same day delivery	Delivery on another day	0.217*	0.067	0.014
	Express delivery	0.147*	0.050	0.036
	Collection of dry waste	0.434*	0.139	0.022

Note. *p < 0.10; **p < 0.05; ***p < 0.01; ****p < 0.001.

The significant difference between same day delivery (2) – delivery on another day (3), same day delivery (2) – express delivery (4) and same day delivery (2) – collection of dry waste (5), implied that concept 2, same day delivery, had a significant higher compatibility than the other three services. However, no significant difference was found between services 1 and 2, implying that these services were considered statistically similar by the respondents.

Complexity

An overview of the sustainable services per specification of the attribute complexity are given, see figure 15. The specifications were given a score, ranging from 1 (strongly disagree) to 5 (strongly agree) on each service.

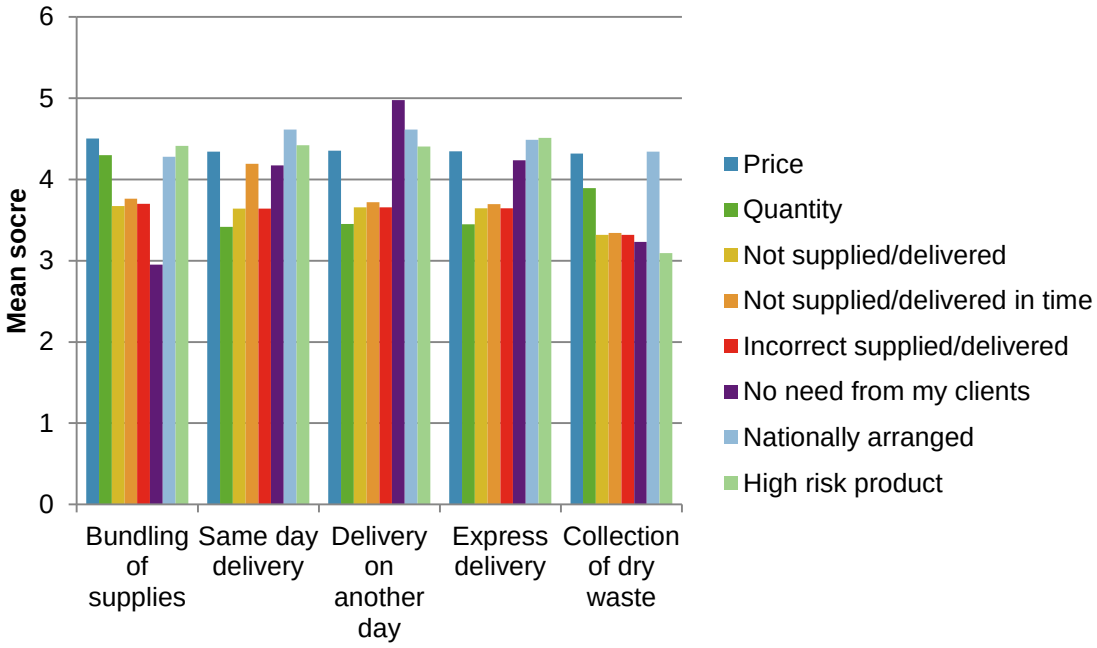

Figure 15 *Mean scores of the specifications of complexity*

Although the high scores in the figure, with each sustainable service exceeding neutrality, might seem a positive result, this is not the case. The scores of the attribute 'complexity' need to be reversely interpreted, wherein a higher score can be explained as a barrier to the respondent, see appendix E. In this specific case, respondents indicated the five sustainable services as being complex. The 'same day delivery' and 'delivery on another day' services had higher scores on all specifications, compared to the other services. 'Collection of dry waste' yielded the lowest mean score on all specifications. The specifications 'price', 'nationally arranged' and 'high risk product' had

the highest mean scores on all services, implying that respondents experienced the related barriers as high. Finally, it can be deduced from the figure that the specifications 'not supplied/ delivered', 'not supplied/ delivered in time' and 'incorrect supplied/ delivered' had generally lower scores on all services, implying that respondents indicated these services as less complex.

A one-way repeated measures ANOVA was conducted to compare scores on 'complexity', component 1: supplies/ deliveries, 'same day delivery', 'delivery on another day' and 'express delivery' (N = 31). The means and standard deviations are presented in table 7. No significant effect was found for 'complexity' (p = 0.325), Wilks'Lambda = 0.968, F (1, 30) = 1, and multivariate partial eta squared = 0.032.

Table 7 *Complexity for the three sustainable services for component 1*

	Mean	**Std. Deviation**
Same day delivery	3.839	0.818
Delivery on another day	3.850	0.809
Express delivery	3.850	0.809

As can be derived from tables 7 and 8, mean values from component 1 and 2: 'supplies/ deliveries', and 'external factors' respectively, range from 3.711 to 3.850. These results imply that respondents generally answered neutral – to – positive, when asked about the complexity of services. Subsequently, no significant difference was found between the three services on component 1 and 2, see appendix E. The other two services, 'bundling of supplies' and 'collection of dry waste' were excluded from analysis due to too many missing values.

A one-way repeated measures ANOVA was conducted to compare scores on complexity component 2: external factors, at 'same day delivery', 'delivery on another day' and 'express delivery' (N = 19). Means and standard deviations are given in table 8. No significant effect was found for 'complexity', (p = 0.389), Wilks'Lambda = 0.895, F (2, 17) = 1, multivariate partial eta squared = 0.105.

Table 8 *Complexity for the three sustainable services for component 2*

	Mean	**Std. Deviation**
Same day delivery	3.711	0.948
Delivery on another day	3.790	0.805
Express delivery	3.740	0.948

Overview

An overview of the mean values of the attributes of Rogers (1995) is given in table 9. From this table it can be deduced that the mean scores were low on all attributes, including on 'complexity', which needs to be reversibly interpreted. 'Same day delivery' had the relatively highest score on all attributes.

Table 9 *The mean values of the attributes as proposed by Rogers (1995)*

	Relative Advantage	**Compatibility**	**Complexity**	
			Component 1: supplies/deliveries	Component 2: external factors
Bundling of supplies	2.471	1.690		
Same day delivery	2.679	1.970	3.839	3.711
Another day delivery	2.629	1.750	3.850	3.790
Express delivery	2.662	1.820	3.850	3.740
Collection of dry waste	2.103	1.530		

Logistic regression

Logistic regression analysis was performed to assess the impact of a variety of factors that potentially influenced the retailers' level of willingness to pay. The model contained three independent variables: (1) relative advantage, (2) compatibility and (3) complexity, which was tested for each of the five services. However, a valid logistic regression analysis was unavailable for the attribute complexity, due too many missing values.

First, the model tested for bundling of supplies explained between 32.9% (Cox and Snell R^2) and 84.2% (Nagelkerke R^2) of the variance in willingness to pay, and has a model fit of 1.000 (Hosmer-Lemeshow test), see table 10. No significant relation was found for relative advantage and compatibility in the investigated relation between the service bundling of supplies and the willingness to pay.

Table 10 *Logistical regression analysis of bundling of supplies*

	Block 0	Block 1	Block 2
Characteristic/ variable			
B (SE)	-2.621 (0.366)****		
Wald	51.233		
Nagelkerke R^2		0.086	0.842
Cox & Snell R^2		0.034	0.329
Hosmer-Lemeshow test			1.000
Control variables			
Gender			-4.551 (2.291)
Age			2.655 (1.716)
Business			-32.032 (20065.603)
Retail			-20.633 (1558.220)
Health			-34.797 (27879.707)
Hospitality			5.793 (4.147)
Independent variables			
Relative advantage			-0.808 (1.485)
Compatibility			18.924 (1558.218)

Note. *p < 0.10; **p < 0.05; ***p < 0.01; ****p < 0.001. Values of B and Std. error are given in parentheses.

Secondly, the model tested for same day delivery explained between 39.8% (Cox and Snell R^2) and 81.1% (Nagelkerke R^2) of the variance in willingness to pay, and has a model fit of 1.000 (Hosmer-Lemeshow test), see table 11. A significant, negative relation was found for relative advantage (p = 0.051), whilst a positive significant relation was found for compatibility (p = 0.033), in the investigated relation between the service same day delivery and willingness to pay. In addition, a negative significant relation was found for the control variables age, retail and hospitality.

Table 11 *Logistical regression analysis of same day delivery*

	Block 0	Block 1	Block 2
Characteristic/ variable			
B (SE)	-2.316 (0.293)****		
Wald	53.020		
Nagelkerke R^2		0.080	0.811
Cox & Snell R^2		0.039	0.398
Hosmer-Lemeshow test			1.000
Control variables			
Gender			-1.144 (1.413)
Age			-3.258 (1.551)**
Business			9.457 (16039.408)
Retail			-5.599 (3.376)*
Health			14.815 (24434.112)
Hospitality			-8.300 (4.294)*
Independent variables			
Relative advantage			-5.080 (2.601)*
Compatibility			10.137 (4.752)**

Note. *p < 0.10; **p < 0.05; ***p < 0.01; ****p < 0.001. Values of B and Std. error are given in parentheses.

Thirdly, the model tested for same day delivery explained between 21.8% (Cox and Snell R^2) and 59.8% (Nagelkerke R^2) of the variance in willingness to pay, and has a model fit of 0.999 (Hosmer-Lemeshow test), see table 12. No significant relation was found for relative advantage in the investigated relation between the service 'delivery on another day' and the willingness to pay.

Table 12 *Logistical regression analysis of delivery on another day*

	Block 0	**Block 1**	**Block 2**
Characteristic/ variable			
B (SE)	-2.755 (0.390)****		
Wald	49.936		
Nagelkerke R^2		0.045	0.598
Cox & Snell R^2		0.016	0.218
Hosmer-Lemeshow test			0.999
Control variables			
Gender			0.332 (1.115)
Age			0.364 (1.192)
Business			18.283 (16104.483)
Retail			1.207 (1.991)
Health			20.990 (24823.277)
Hospitality			-0.871 (2.017)
Independent variables			
Relative advantage			0.882 (1.056)
Compatibility			1.354 (0.661)**

Note. *p < 0.10; **p < 0.05; ***p < 0.01; ****p < 0.001. Values of B and Std. error are given in parentheses.

Fourthly, the model tested for same day delivery explained between 25.2% (Cox and Snell R^2) and 60.3% (Nagelkerke R^2) of the variance in willingness to pay, and has a model fit of 0.998 (Hosmer-Lemeshow test), see table 13. No significant relation was found for relative advantage in the investigated relation between the service 'express delivery' and the willingness to pay.

Table 13 *Logistical regression analysis of express delivery*

	Block 0	Block 1	Block 2
Characteristic/ variable			
B (SE)	-2.476 (0.347)****		
Wald	50.878		
Nagelkerke R^2		0.052	0.603
Cox & Snell R^2		0.022	0.254
Hosmer-Lemeshow test			0.998
Control variables			
Gender			0.229 (1.007)
Age			0.018 (1.016)
Business			18.296 (19650.885)
Retail			0.65 (1.216)
Health			19.810 (40193.020)
Hospitality			-0.704 (1.947)
Independent variables			
Relative advantage			0.044 (1.105)
Compatibility			1.935 (1.055)*

Note. *p < 0.10; **p < 0.05; ***p < 0.01; ****p < 0.001. Values of B and Std. error are given in parentheses.

Fifth, and finally, the model tested for same day delivery explained between 15.5% (Cox and Snell R^2) and 54.2% (Nagelkerke R^2) of the variance in willingness to pay, and has a model fit of 1.000 (Hosmer-Lemeshow test), see table 14. No significant relation was found for relative advantage and compatibility in the investigated relation between the service 'express delivery' and the willingness to pay.

Table 14 *Logistical regression analysis of collection of dry waste*

	Block 0	Block 1	Block 2
Characteristic/ variable			
B (SE)	-3.170 (0.457)****		
Wald	48.209		
Nagelkerke R^2		0.109	0.542
Cox & Snell R^2		0.031	0.155
Hosmer-Lemeshow test			0.259
Control variables			
Gender			-3.333 (2.520)
Age			-0.384 (1.105)
Business			16.999 (18507.430)
Retail			0.189 (1.453)
Health			14.597 (27099.335)
Hospitality			1.843 (2.458)
Independent variables			
Relative advantage			1.096 (1.108)
Compatibility			0.889 (.556)

Note. *p < 0.10; **p < 0.05; ***p < 0.01; ****p < 0.001. Values of B and Std. error are given in parentheses.

Trialability

As mentioned before, the attribute trialability was not measured in accordance with Rogers' (1995) theory of innovation, due to the services not yet having surpassed the early stage(s) of the PLC. Instead, respondents were asked whether they were interested in testing the services. An overview of the sustainable services of the attribute 'trialability' is given, see figure 16. The services specifications were given a score, ranging from 1 (strongly disagree) to 5 (strongly agree).

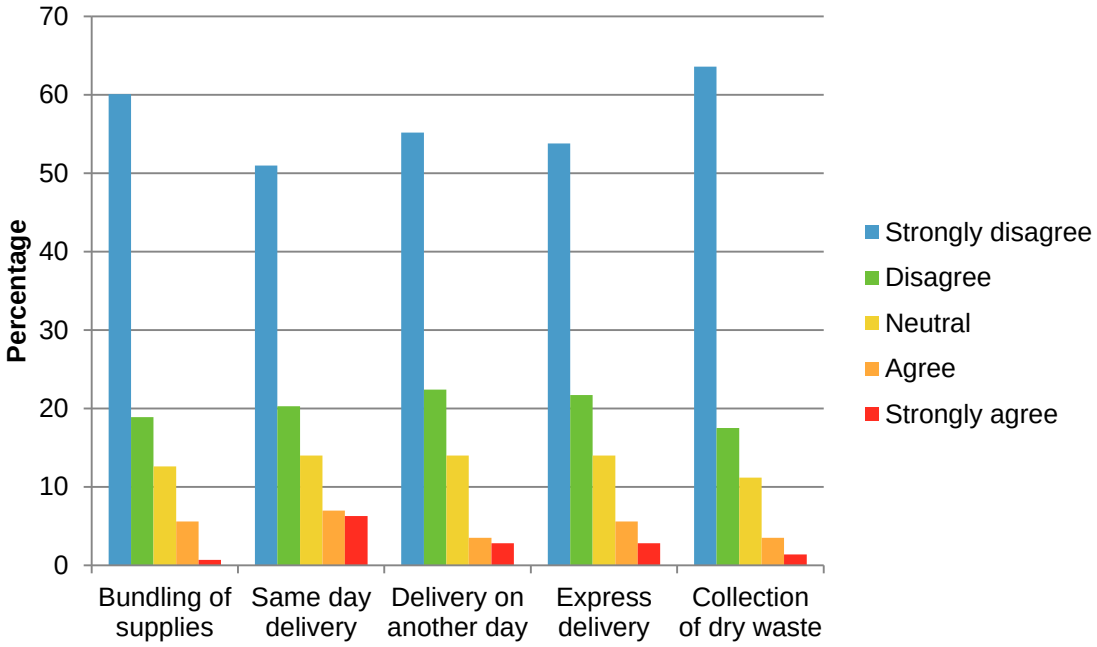

Figure 16 *Percentage of the sustainable innovative concepts on trialability*

As can be derived from the figure, scores are mainly negative, implying that respondents had little intention of trying one of these services in the future. Especially, scores for 'dry waste collection' are low, with 63,6% of respondents listing 'strongly disagree' as answer. As can be observed from the figure, the two positive options, 'agree' and 'strongly agree', had very low scores, implying that there are very few respondents who showed an intention of trying these services in the future.

A one-way repeated measures ANOVA was conducted to compare scores for 'trialability' at 'bundling of supplies', 'same day delivery', 'delivery on another day', 'express delivery' and 'collection of dry waste' (N = 138). Means and standard deviations are given in table 15. A significant effect was found for 'trialability' ($p = 0.011$), Wilks'Lambda = 0.908, $F (4, 134) = 4.408$, and multivariate partial eta squared = 0.092.

Table 15 *Trialability for the five sustainable services*

	Mean	**Std. Deviation**
Bundling of supplies	1.610	0.900
Same day delivery	1.930	1.216
Delivery on another day	1.730	1.022
Express delivery	1.780	1.067
Collection of dry waste	1.570	0.935

As can be derived from table 15, mean values of the attribute 'trialability' range from 1.570 to 1.930, implying that respondents generally had no intention of trying these services in the future. 'Same day delivery had the relatively highest score, although it did not exceed the 'disagree' mark.

From table 16, it can be observed that there exist significant differences between same day delivery (2) – bundling of supplies (1), same day delivery (2) – delivery on another day (3), same day delivery (2) – express delivery (4) and same day delivery (2) – collection of dry waste (5). This implies that 'same day delivery' had a relatively higher trialability, see appendix F.

Table 16 *Trialability pairwise comparisons*

Service	**Other services**	**Mean difference**	**Std. Error**	**Sig.**
Same day delivery	Bundling of supplies	0.326*	0.117	0.060
	Delivery on another day	0.203**	0.069	0.039
	Express delivery	0.159**	0.051	0.020
	Collection of dry waste	0.362**	0.115	0.019

Note. *p < 0.10; **p < 0.05; ***p < 0.01; ****p < 0.001.

Observability

Similar to the attribute trialability, observability was not measured in accordance with Rogers' (1995) theory of innovation, due to the service not yet having surpassed the early stage(s) of the PLC. Instead, respondents were asked if they were familiar with City Logistics. There are slightly more respondents who are familiar with City Logistics (52.4%), than respondents who are unfamiliar (47.6%). The respondents stated that familiarity with City Logistics stemmed from having seen the small electric vehicles (51.0%), followed by 'via other retailers' (2.1%). The remaining 46.9% are missing values.

Other services desired by the retailers

Other desires of the retailers were systematically collected using an open-ended question, in the final stage of the questionnaire. One of the most frequently listed opinions was that retailers experienced economically tough times. This in turn limited their financial ability to test new, innovative services. Additionally, retailers were generally dissatisfied with the municipality, due to high parking fees and the high number of cyclists in the inner city. This combination made the city unattractive in their eyes. In line of these complaints, several retailers suggested that the current study should not have been conducted with them, but instead should be aimed at the municipality and transporters. The retailers additionally emphasized that they, especially those in the hospitality sector, suffered from an excess of cardboard, plastic and glass. Often, they did not have sufficient storage place. For similar reasons, clothing stores showed little interest in bundling their supplies for lack of storage space within the shops. Finally, retailers expressed their interest on using the small electric vehicles as a marketing tool.

Analysis

In this chapter the results of this study are compared to the existing literature.

Willingness to pay

Alongside Rogers' (1995) attributes, the willingness to pay was also investigated. This additional question is highly relevant, since knowledge of the inclination of retailers to invest in City Logistics, is vital for the continuous development of the business model. The majority of retailers expressed no intention of paying any amount, for any of the five services. This result was expected, since a similar study was conducted in Nijmegen where they are operating on subsidies (Hendriks, Hofenk, Quak, 2009). A possible explanation for the results of the current study is that the sustainable services were in a too early phase of the PLC. However, a logistic regression analysis was conducted in order to investigate the relation between the willingness to pay and relative advantage, compatibility and complexity, i.e. see Claudy et al. (2011).

Relative advantage

Considering the attribute relative advantage, respondents generally held a negative opinion of the different services. Rogers (1995) states that in order for successful adoption of an innovation, the relative advantage needs to be as high as possible, meaning that the respondents experience the innovation as an improvement over the existing product or service. The current results revealed that the respondents preferred to continue using the existing logistical services, instead of implementing one of the new services. Even though the respondents were in general negative towards these services, the express delivery service yielded the highest relative advantage, whilst collection of dry waste yielded the lowest relative advantage. A possible explanation in a practical sense might be found in sector differences, wherein each retailer has a separate frame of reference. Additionally, the results revealed that the respondents indicated social prestige as the highest specifications in all services. This corresponds with the goal of City Logistics to operate in a sustainable way.

'Low initial costs' were indicated as the lowest specification, likely due to just one of the services: 'collection of dry waste', corresponding to the current situation, whereas the other four are considered new and innovative services. A significant difference was found between the services collection of dry waste (5) – bundling of supplies (1), collection of dry waste (5) – same day delivery (2), collection of dry waste (5) – delivery on another day (3) and collection of dry waste (5) – express delivery (4), implying that service 5, 'collection of dry waste', had a significantly reduced relative advantage than each of the other four services. A possible explanation for this result is that the collection of dry waste is an already existing weekly service from the municipality. Each of the remaining four services is considered to be new, with the respondents indicating the services as a statistically significant relative advantage. However, the mean values given by the retailers need to be taken into account, since none of them exceeds 'neutrality', thereby implying an averagely negative response, although the response is relatively higher than given to the collection of dry waste.

Hypothesis 1 (relative advantage) was tested using logistical regression analysis, which controlled for age, gender and sector distribution. Hypothesis 1 was rejected for each service, however, a negative, significant relation was found between willingness to pay and relative advantage for same day delivery. Analysis revealed that a lower level of relative advantage was

related to a higher level of willingness to pay by the retailers. This result is not in line with theoretical expectations, and does not correspond with the results found by Claudy et al. (2011), who found a positive, significant relation between relative advantage and the willingness to pay. A potential explanation for this result is that most people take for granted that an innovation holds an advantage over the existing product or service ((Lefkoff-Hagius & Mason, 1993; Tambini, 1999; Ruyter, Wetzels, & Kleijnen, 2001), resulting in retailers not seeing the relation between having multiple advantages and therefore are not willing to pay for use of the services. The rejection of the other four services can potentially be explained by the fact that the services have not yet surpassed the early phase of the PLC, thereby resulting in the inability for retailers to imagine the advantages the services hold for their respective store. An additional factor is that these four services aim to solve a problem from a logistical point of view, thereby resulting in advantages for the logistical companies, e.g., decreasing costs of the last mile transportation (Gevaers, 2009). For example, bundling of supplies is an advantage for individual logistic companies, since this prevents the necessity of making multiple, individual trips into the inner city. The retailers, however, do therefore not experience a problem or an advantage in using these services.

Compatibility

Compatibility, the attribute measured third, revealed that the respondents were generally negative towards the compatibility of the five sustainable services with their current logistical methods. Rogers' (1995) theory states that for successful adoption of an innovation, the compatibility needs to be high. High compatibility implies that the adopters experience the innovation as a service that connects well with their existing activities. A possible reason for the low rate of compatibility in this study might be found in the fact that the services are still in an early stage of the PLC (Teece et al., 1997), thereby creating difficulties for retailers to imagine the situation with one of the services, since detailed descriptions of the services were not yet available.

In addition, a significant difference was found between services same day delivery (2) – delivery on another day (3), same day delivery (2) – express delivery (4) and same day delivery (2) – collection of dry waste (5), implying that service 2, 'same day delivery', has a significantly higher compatibility than each of the other three services. A possible explanation is the compatibility of same day delivery services to the emerging and rapid growing e-commerce, whilst the other three lack this compatibility. No significant difference was found between services 1 and 2: 'same day delivery' and 'bundling of supplies', which means the services are considered statistically similar by the respondents. This can potentially be explained through the fact that same day delivery services and bundling of supplies are both entirely new innovative ideas, which are not yet on the market. Therefore, it could be the 'gap' that retailers were looking for.

Hypothesis 2 was tested using logistical regression analysis, which controlled for age, gender and sector distribution. Hypothesis 2 was confirmed for same day delivery, delivery on another day and express delivery, whilst the hypothesis was rejected for the other two services. For the services same day delivery, delivery on another day and express delivery, analyses revealed that a higher level of compatibility was related to a higher level of willingness to pay by the retailers. This result does not correspond with the results found by Claudy et al. (2011), who did not find a significant relation between compatibility and willingness to pay. A potential explanation is that these services are essentially an extrapolation from existing delivery services, resulting in a relatively high number of retailers who can imagine the compatibility usage of either of these services holds for their respective store. Retailers are in turn willing to make a (limited) monetary investment. However,

hypothesis 2 was rejected for bundling of supplies and the collection of dry waste. This result can potentially be explained by the fact that the services have not yet surpassed the early phase of the PLC, thereby resulting in the inability for retailers to imagine the compatibility usage of the services hold for their respective store. An additional factor is that bundling of supplies aims to solve a problem from a logistical point of view and therefore does not connect well with current activities of the retailers. The service of collection of dry waste is a replacement of the already existing collection of dry waste by the municipality. The service has therefore inherently remained unchanged, resulting in retailers who do not experience the compatibility of this service.

Complexity

The results of the current study, on the fourth measured attribute complexity, revealed that the respondents were generally positive towards the services. However, the values of complexity need to be inversely interpreted. The results therefore revealed that the respondents indicated the five services as complex. Rogers (1995) stated that for a high rate of adoption, the attribute complexity needs to be as low as possible. According to the respondents, the collection of dry waste has the lowest barriers for successful adoption. This is in line with Rogers' (1995) theory, which states that when services are experienced as easy to understand, barriers for adoption of the service are low. This can potentially be explained by the fact that this service is the most familiar, since almost every retailer had an existing arrangement for the pickup of dry waste. Three specifications, namely: 'price', 'nationally arranged' and 'high risk', were seen as a higher barrier than the other specifications. A possible explanation could be that the retailers are primarily focused on financial matters, due to the current economical situation. Additionally, when a retailer is affiliated with a nationally operating chain of stores, barriers for adoption are high due to the inability to make individual decisions regarding changes to the store or the supply routes. A high barrier is also formed by products that have a high risk, e.g. refrigerated or fragile products. In addition, the specifications, 'not supplied/ delivered', 'not supplied/ delivered in time' and 'incorrectly supplied/ delivered', in general had lower scores on all services, which implies that the barriers are relatively lower. This can potentially be explained by the fact that the retailers are already used to these specifications when it comes to packages.

No significant difference was found between three services (same day delivery, delivery on another day and express delivery) on two components: 'supplies/ deliveries' and 'external factors'. In this case, just three services, 'same day delivery', 'delivery on another day' and 'express delivery' were taken into account since the other two services had too many missing values for valid analysis.

Hypothesis 3 was tested using logistical regression analysis, which controlled for age, gender and sector distribution. Hypothesis 3 was neither confirmed, nor rejected. A valid logistic regression analysis was unavailable for the attribute complexity, due too many missing values. This can potentially be explained by the fact that services have not yet surpassed the early stages of the PLC, which resulted in the services not being on the market yet. A second explanation stems from the answer categories which were used in the questionnaire. The question regarding complexity had 'not applicable' as answer category, which was used frequently by the retailers. This directly resulted in the high number of missing values.

Overview

When comparing the mean values, it can be concluded that the scores are relatively low. The attribute relative advantage scores vary between 2.103 and 2.679; compatibility vary between 1.530

and 1.970, and trialability vary between 1.570 and 1.930. The attributes complexity has mean scores varying between 3.711 and 3.850, which means the services are seen as a high barrier to the respondents.

The service of same day delivery had the highest scores, although the services were on average judged negatively. A possible explanation is that the innovation is still in an early stage and therefore the majority of the retailers show little interest in the sustainable services. This is similar with the theory of Rogers (1995), wherein the innovators are the first 2.5% of individuals in a social system who adopt an innovation. This group of people are often the first to try and develop a newly introduced innovation and are willing to take risks. In this study, a minority of the retailers were willing to pay for the services. Therefore, it can be concluded that according to the current results, the majority of people were not interested in the services . However, it is vital for a provider of a new innovative product or service, to efficiently identify and target this group of innovators (Vowles, Thirkell, & Sinha, 2011).

Logistic regression analyses were conducted for each of the five services, for the attributes relative advantage, compatibility and complexity. Analyses resulted in three confirmations, seven rejections and five indeterminate outcomes, out of a total of fifteen possibilities, see table 17.

Table 17 *Overview hypotheses*

	Relative advantage	**Compatibility**	**Complexity**
Bundling of supplies	Rejected	Rejected	Indeterminate
Same day delivery	Rejected	Confirmed	Indeterminate
Delivery on another day	Rejected	Confirmed	Indeterminate
Express delivery	Rejected	Confirmed	Indeterminate
Collection of dry waste	Rejected	Rejected	Indeterminate

Trialability

Results on the attribute trialability, revealed that the respondents (currently) had little intention of testing the five services in the future. Due to the sustainable services being in the development phase of the PLC during the period in which the study was conducted (Teece et al., 1997), it was not possible to explore trialability as explained by Rogers (1995). Rogers (1995) defined trialability as the extent to which the innovation is suitable to try or test. In this case, it was investigated whether the respondents showed an intention of trying the service in the future, since the services were still in the development phase. Due to the services still being developed, the services were not yet suitable for a trial by the respondents. This functions as a potential explanation for the current results, wherein the respondents indicated little intention of testing the services in the future. A secondary potential explanation, is that the retailers all belong to different sectors, each with their own specific interests. Another possible explanation is that is it difficult to apply trialability on services, since it demands consumers to invest a substantial amount of time and effort to try the innovation (Kleijnen, De Ruyter, & Wetzels, 2004)

A significant difference was found between the services same day delivery (2) – bundling of supplies (1), same day delivery (2) – delivery on another day (3), same day delivery (2) – express delivery (4) and same day delivery (2) – collection of dry waste (5), implying that service 2, 'same day delivery', had a significantly higher trialability than each of the other three services. This can potentially be explained by the relative newness of the service, leading to the possibility of respondents to experiment with the service.

Observability

The results of the current study on 'observability', the attribute which was measured first, revealed that approximately half of the respondents were familiar with City Logistics. This was largely due to familiarity with the small electric vehicles used by City Logistics. Due to the sustainable services being in the development phase of the PLC during the period in which the study was conducted (Teece et al., 1997), it was not possible to explore observability for each service. This is in line with the explorative stage, as proposed by Teece et al. (1997), wherein development of a service is characterized by high investment in R&D, combined with general knowledge building in order to exploit a specific gap in the current market, or to create a potential new market. This functions as a possible explanation why only half of the respondents were familiar with City Logistics Delft.

Other services desired by the retailers

Many retailers used this opportunity to emphasize their difficult financial position in the current economic crisis and decreasing numbers of shoppers due to e-commerce competition, leaving little room to spend money on a new service which does not yield any visible (monetary) results. Even though the situation is currently difficult for the retailers, they generally expressed little intention to change or improve upon the situation, e.g., many retailers revealed they deliver their products themselves, without realizing the inefficient investment in terms of time and money. However, according to the Ministry of Economic Affairs (2015), shop owners need to rapidly respond to changes in the retail sector. Due to, among others, new technologies and changes in both population and the economy, desires of consumers are changing. Consumers are spending more time on online shopping, have more information about products, change their spending pattern and place more value on convenience and experience (Ministry of Economic Affairs, 2015). These changes are accelerating and it is crucial for retailers to be both flexible and innovative. When retailers do not respond to these changes quickly enough, many of them might not (economically) survive. This in turn results in a higher number of unoccupied stores within cities, thereby making the city increasingly unattractive (Ministry of Economic Affairs, 2015). A second point which was highlighted by multiple retailers, was complaints addressed to the municipality regarding sharply increasing parking fees (largely due to the problematic investment policy of the municipality in a new railway station) and the high number of cyclists in the inner city, the combination of which resulted in unpleasant conditions for shoppers to visit Delft (Muñuzuri, Cortés, Guadix, & Onieva, 2012). In line with findings from a similar study conducted in Nijmegen (Hendriks, Hofenk, Quak, 2009), several retailers suggested that the current study should be conducted with the transporters, since they control the supply lines of the retailers. Additionally, the municipality is in the position to maximize efficiency within the dense infrastructure and high commercial density, by altering regulations (Muñuzuri, Cortés, Guadix, & Onieva, 2012; Quack, 2008). Furthermore, the hospitality dislikes the high amount of dry waste produced on a weekly basis, since they do not have sufficient storage space within/ around their respective restaurants/ cafés. The clothing stores additionally emphasized

a lack of intention to bundle their products for similar reasons; a lack of sufficient storage space. Finally, several respondents asked for the possibility to use the small electric vehicles as a marketing tool. These retailers explained their difficulty in surviving under the current financial conditions, and they were on the lookout for smart and cheap marketing solutions.

Incumbent

From the current results it can be obtained that the adoption of the five sustainable services are generally viewed as negative by the retailers. A possible explanation for these results is the fact that the services are in the development phase of the PLC. In this phase of the process, a start-up would experience a very tough situation. In this situation there would be very little time and money, leaving no room for the improvement of products or services. In most cases, this would be the end for a start-up. However, in this specific case, City Logistics operates within an incumbent: PostNL. This forms a major advantage, since this allows City Logistics to make use of the many financial, technological and logistical capabilities of PostNL (Chandy & Tellis, 2000). Additionally, the logistical network of PostNL, will help City Logistics to reach the people needed to make it a success. Therefore, it is likely that these capabilities and the network allow City Logistics to continually invest, thereby gaining increased competitive advantage.

Conclusions

In this study, the adoption of five sustainable services developed by PostNL City Logistics was studied among the retailers in Delft. City Logistics, a new department of PostNL, explores the possibilities of a new sustainable business model. The adoption of these five services was investigated using the five attributes of Rogers (1995), namely: relative advantage, compatibility, complexity, trialability and observability. The five sustainable services which were investigated are: (1) bundling of supplies, (2) same day delivery, (3) delivery on another day, (4) express delivery, and (5) collection of dry waste.

The study sought to provide insight into the adoption of the five sustainable services of City Logistics in Delft. Therefore, the leading research question of this study was: *Which sustainable service(s) of City Logistics have the highest potential to be adopted by the retailers in Delft?*

A questionnaire was conducted at N = 143 out of 590 retailers in the inner city of Delft, in order to investigate which of the five sustainable services had the highest potential for adoption. Each retailer was physically visited (n = 141) and asked to participate to the research, in addition, n = 2 retailers participated via e-mail. Through the use of multiple one-way repeated measures ANOVA's, the attributes were tested and an overview of the mean values was obtained. Finally, the relation between willingness to pay and the three attributes relative advantage, compatibility and complexity was tested using a logistic regression analysis.

According to the results of the study, just over half of the respondents were familiar with City Logistics. Concerning the sustainable services, the respondents generally showcased negative opinions. The majority of the retailers currently indicated little interest in the sustainable services. However, 56% of the retailers showed an intention (7.0% strongly agreed; 18.9% agreed; 30.1% replied neutrally) of using one or more of the services in the future. This implies that retailers are potentially interested in the services of City Logistics, but might need some time before using them.

The same day delivery service had the highest scores on relative advantage, compatibility and trialability, in combination with the lowest score on complexity. However, mean scores did not exceed mean neutrality. A possible explanation for these negative findings, was that the innovation was only introduced by City Logistics in January 2015. The innovation was therefore relatively new.

Since the services had not yet surpassed the early stages of the PLC during the time the current research was conducted, a new conceptual model for willingness to pay was developed. The newly developed model was created to investigate the relation between willingness to pay and relative advantage, compatibility and complexity using logistic regression analysis. The analyses revealed that a lower level of relative advantage and a higher level of compatibility, are related to a higher level of willingness to pay by the retailers for the service same day delivery. For both services 'delivery on another day' and 'express delivery', analyses revealed that a higher level of compatibility was related to a higher level of willingness to pay by the retailers. Valid logistic regression was unavailable for the attribute complexity, due to too many missing values. Therefore, in this study no conclusions could be drawn between the relation between willingness to pay and complexity. Furthermore, six out of fifteen potential options were rejected. A possible explanation is that these services aim to solve a problem from a logistical point of view, or replace an already existing service.

Several retailers used the open-ended final question of the questionnaire, to indicate a desire for services which might provide a solution to their difficult financial position, and/ or the currently unpleasant shopping conditions due to high parking fees and high number of cyclists. Furthermore, several respondents indicated an interest in using the small electric vehicle as a marketing service.

City Logistics is developing the services to the maximum of their potential. A major advantage for City Logistics is that they are part of PostNL, since this allows for the use of many financial and technological capabilities, as well as the existing logistical network. Therefore, City Logistics is in a more favorable situation than a regular startup.

Discussion

The limitations of the current research are discussed in this chapter. These limitations are relevant for the interpretation of the results, as they may influence validity and reliability of the results.

Sample size

Data was gathered from N = 143, or 24.24%, out of 590 retailers present within the inner city of Delft. Although the majority of the retailers was not included in this research, which might be interpreted as a limitation to the current study, several factors need to be taken into account. First, N = 143 retailers was a mathematically calculated figure, using a confidence level of 95% and a confidence interval of 7. Furthermore, retailers were randomly selected using a random number generator, in order to ensure validity of the sample.

Bias hospitality

Differences exist in the industry classification of the sample, in comparison with the total make-up of the retailers of Delft, as indicated by figures 5 and 6. This difference occurred due to the use of the random number generator, wherein respondents were selected randomly in order to allow each individual retailer in the inner city of Delft a mathematically equal chance to participate in the study. A second explanation for the found differences, might be due to the opening hours of the hospitality sector, which often start at 17:00. The researcher who conducted the physical visits to the retailers, primarily did so between 09:00 and 17:00, leading to underrepresentation of the hospitality sector. A third and final explanation for the differences, stems from the nature of the business conducted in the hospitality sector. They often refused cooperation due to their terraces being filled with people, which led to the manager being unavailable to conduct the questionnaire with. In future studies it is recommended to widen the visiting hours, potentially also including weekends, in order to allow for a better representation of the different sectors within Delft.

Questionnaire

This study contains a first scan of the adoption of a City Logistics model, which was investigated through the use of questionnaires. The questionnaire was chosen due to its ability to reach large groups of respondents within a short time span (Leary, 2008). However, an inherent limitation of questionnaires is the inability for the researcher to ask follow-trough questions to understand exactly why a respondent gave a specific answer. Multiple-choice answer categories always run the risk of (unknowingly) steering the thought process of a respondent, thereby leading the respondent to supply a different answer than might have been supplied to an open-ended question (Leary, 2008). Therefore, when further research is conducted, it is advised to conducted in-depth interviews to gain a better understanding of the motives and desires of the retailers regarding the sustainable services.

Questions

For the purpose of the current study, a questionnaire was developed, based on Rogers' theory of innovation (1995). For the development of the questions regarding the attribute complexity, information was selected from internally available documents (Rademakers, 2014). Due to the limited time available for the current research project, insufficient time was available for validation of the specifications for the attribute complexity prior to conduction of the research. According to

Rogers (1995), complexity entails the ease with which individuals understand an innovation. For the purpose of this thesis, complexity was operationalized differently, out of necessity as previously explained. In addition, 'not applicable' was added as answer category in the questionnaire. This answer was selected by the majority of respondents, thereby leading to too many missing values and the inability for valid statistical analysis of the data. For future research, it is strongly advised to exclude this answer option from the questionnaire. Finally, if the attribute complexity had been approached in this study as described by Rogers (1995), a lower level of complexity would have been expected. According to Tan & Teo (2000), innovations on products are more complex to use and understand than innovations on services. Therefore, it is advised to include the attribute complexity as described by Rogers (1995) in future research.

All eight specifications of the attribute complexity were used to investigate all services. However, in hindsight, several specifications should have been excluded. For example, the combination 'no need from my clients' and bundling of supplies is irrelevant, since customers have nothing to do with the supply of products. The same applies to collection of dry waste, in combination with the specifications 'not supplied/ delivered', 'not supplies/delivered in time', 'incorrect supplied/ delivered' and 'no need from my clients'.

An extra question was asked regarding the willingness to pay, since it is highly interesting to know if, and how much, respondents are willing to pay for these services. In this case, several options were given. However, the possibility exists that the respondents were influenced by the options supplied in the questionnaire and might have given a different answer to an open-ended question.

E-mail

To ensure reliability of the data, questionnaires were conducted using the same standard procedure of physical visits to the retailer (n = 141) wherever possible. However, in order to increase the total amount of respondents, a questionnaire was sent by e-mail to n = 167 retailers, of which n = 2 replied. Logically, differences exist between both methods of data collection. Whilst during physical visits to retailers a verbal explanation could be given when necessary, this was not possible for both retailers who replied via e-mail. The large difference between the total number of retailers who received an e-mail, compared to those who filled in the questionnaire and replied to the e-mail, likely occurred due to the relative ease with which an e-mail can be forgotten or ignored. This was strong confirmation of the choice made prior to conducting the current research, to choose physical visits to the retailers as the main method of data-collection, over digital administration of questionnaires.

City

PostNL City Logistics has chosen to start City Logistics in Delft, due to the small scale whilst simultaneously having the characteristics of a typical large Dutch city, including a highly developed inner city with many waterways and canals. This allows Delft to function as a role model for other Dutch cities. However, one of the results from the current study is that the respondents do not want to adopt the services of City Logistics. Through the open-ended question in the questionnaire regarding 'other services the retailers desire', it became clear that the retailers in Delft have little intention to change. They prefer to continue the way it always has been. A possible explanation might be that differences exist between retailers in different cities, potentially biasing the results due to the research being conducted in Delft. In future studies it is recommended to investigate the adoption of the services in different cities in the Netherlands, in order to compare the results and investigate whether the results do, or do not, vary between cities.

Advice to the company

From the current study it can be concluded that the majority of retailers which were included in this research project, were unwilling to pay for the sustainable services offered by City Logistics. However, it needs to be taken into account that the sustainable services are still in the developmental phase, implying that these services are not yet fully developed. The retailers argue that it is very important for them that the innovation connects closely with the current activities of the retailer. Therefore, it is highly advised to place emphasis on the compatibility of the services because this will offer the best chance that retailers are willing to pay for the services. Subsequently, the scores on the level of willingness to pay have the highest score on the service 'same day delivery', with significant values of $p < 0.10$ for relative advantage and $p < 0.05$ for compatibility. Based on the comparison made between the five sustainable services, the 'same day delivery' service has the highest mean scores by the retailers in Delft. A potential caveat is that the scores given by the retailers, do not exceed the 'neutral' answer category for any of the five sustainable services. 'Same day delivery' is therefore only relatively the answer with the highest mean score. Therefore, it is advised to focus on the service of same day delivery since this service scores highest on the willingness to pay and on the mean scores per attribute. In order to determine possible variation in the willingness to pay or in the potential adoption of the services, it might be highly interesting and relevant for City Logistics to conduct similar research in six months from now and compare the results.

Although the majority of respondents currently replied negatively when asked about the adoption of sustainable services, several respondents responded highly positively. There appears to be a large gap between these two groups of retailers. It is recommended to conduct in-depth interviews with those retailers who have shown a strong intention of adoption of one, or several, of the sustainable services. This method could lead to highly relevant information regarding the reasons why these retailers chose to adopt the services. This knowledge could then be used to try and convince other retailers. Additionally, it is recommended for City Logistics to start a small-scale pilot project in which one of the positively responding retailers has his/ her specific services charted and optimized. After optimization, a second small-scale pilot project can be conducted at a neighboring retailer. Once this pilot project has sufficiently expanded, the next step would be to launch a larger pilot project in which an entire street has his/ her specific service demand charted and optimized.

As mentioned in an earlier stage of this thesis, City Logistics is a new department of PostNL. This implies that City Logistics is part of an incumbent, thereby offering City Logistics access to many financial and technological capabilities, allowing City Logistics to survive in a rapidly changing market. PostNL has a vast logistical network in the Netherlands, as well as in parts of Europe, giving City Logistics the major advantage of being able to make use of this network. Although the next few months will prove to be a challenge for City Logistics in terms of proving feasibility in the rapidly changing market conditions, it should be kept in mind that a regular start-up (without the back-up of an incumbent) would not be viable in a similar position.

Delft appears to be the perfect place to try and reinforce the position of City Logistics, due to the combination of a compact scale of the city, whilst simultaneously having the characteristics of a typical large city in the Netherlands. This research project however, has shown that the retailers in Delft do not seem to be very keen on innovation. It proved a challenge to motivate these retailers to adopt the sustainable services, it is advisable to keep this in mind when the business case of City Logistics is implemented in a another city.

The final recommendation is of a more general nature: to continue with thinking ‘out of the box’. Although this may sound as common sense, it is highly recommended to use all means available to further cater to the needs and desires of the retailers. Possibilities include the transformation of the small electric vehicles to, e.g., moveable coffee bars positioned within the student area of Delft, which can be utilized during hours when the need for the transportation of goods is low. A second possibility is the utilization of the small electric vehicles as passenger transport for the ageing population in the Netherlands, or as a grocery delivery service. Yet another way for City Logistics to gain further recognizability, is to introduce a transport service between parking areas on the outskirts of Delft with transport to the city center. The general challenge is to find ways in which the services offered by City Logistics, hold a larger advantage over currently existing services. The future lies in the creation of an experience for the customer. PostNL and City Logistics have the means to play a vital part in the creation of these (logistical) experiences.

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Appendix A

Geachte ondernemer,

Wij doen onderzoek voor Stadslogistiek Delft naar de behoefte en problemen van ondernemers met duurzaam goederen vervoer in de binnenstad van Delft. Stadslogistiek Delft wil daarbij de leefbaarheid van de stad verbeteren. Dit betekent dat vanuit een overslagstation aan de rand van de stad elektrische wagentjes gaan rijden, die zorgen voor flexibele aflever- en ophaal services, en tegelijkertijd een minimale impact hebben op het milieu en de leefbaarheid in de binnenstad. Daartoe heeft Stadslogistiek Delft een vijftal nieuwe diensten ontwikkeld. Stadslogistiek Delft is een initiatief van PostNL en komt voort uit een samenwerking met de Gemeente Delft. Stadslogistiek Delft wil nu inventariseren welke duurzame en innovatieve diensten aansluiten op de behoefte en problemen van de ondernemers. In deze enquête worden vijf nieuwe diensten geïntroduceerd, welke hieronder kort worden toegelicht.

De vijf nieuwe diensten van Stadslogistiek Delft zijn:
1.Het bundelen van uw goederen op een ieder gewenst tijdstip. Dit betekent dat al uw goederen worden gebundeld op het overslagstation aan de rand van de stad en op een door u aangegeven tijdstip worden afgeleverd bij uw winkel. Hierdoor hoeft u nog maar één keer een handtekening te zetten.

2.Avondbezorging voor uw klanten. Dit betekent dat producten/bestellingen van uw klanten, nog dezelfde avond worden bezorgd bij uw klanten.

3.Bezorging van goederen aan uw klanten op een andere dag. Dit betekent dat goederen aan uw klanten op een door u aangegeven dag bezorgd worden.

4.Expres bezorging. Dit betekent dat goederen aan uw klanten binnen 3 uur bezorgd worden.

5.Ophalen van droog afval. Dit betekent dat het papier/karton en plastic op een door u aangegeven tijdstip worden opgehaald bij uw winkel.

Graag willen wij weten welke van de genoemde nieuwe diensten u aanspreken en waar u behoefte aan heeft. Dit helpt ons bij het verder ontwikkelen van deze diensten in de binnenstad. De enquête is opgebouwd uit een aantal algemene vragen en vragen over de vijf nieuwe diensten. Het invullen van de enquête neemt ongeveer 15 minuten in beslag. De gegevens die u verstrekt zullen vertrouwelijk worden behandeld en niet aan derden worden verstrekt.

Uw medewerking stellen wij zeer op prijs.

1.Wat is de naam van uw bedrijf?

2.Onder welke branche valt uw bedrijf?

O Zakelijke dienstverlening
O Detailhandel
O Groothandel
O Industrie
O Zorg
O Bouw
O Transport
O Horeca
O Overig

3.Wat is uw geslacht?

O Man
O Vrouw

4.Wat is uw leeftijd?

O <20
O 20-30

O 31-40
O 41-50
O 51-60
O 61-70
O >70

5.Wat is uw hoogst genoten opleiding?

O Geen / lager – of basisonderwijs
O VMBO, MAVO, LBO
O MBO
O HAVO / VWO
O HBO / WO

6.Was u reeds bekend met Stadslogistiek Delft?

O Nee
O Ja

7.Hoe bent u bekend geworden met Stadslogistiek Delft?

O Krant
O Via andere winkeliers
O Internet
O Elektrische wagentjes
O Elektrische fietsen
O Anders, namelijk
O n.v.t.

8.In hoeverre is Stadslogistiek Delft een nieuwe service voor u?

	Helemaal niet				**Helemaal wel**
Nieuwe service	O	O	O	O	O

9.Wat vindt u van de huidige levering van uw goederen?

O Slecht
O Ontevreden
O Neutraal
O Tevreden
O Goed
O n.v.t.

10.Wie is uw huidige leverancier?

11.Hoe vaak per week worden er goederen geleverd?

O <1
O 1-2
O 3-4
O 5-6
O >=7
O n.v.t.

12.Ziet u meerdere leveringen per dag als een belemmering voor uw werk?

	Helemaal niet				**Helemaal wel**	**n.v.t.**
Belemmering	O	O	O	O	O	O

13.Als u zelf mocht kiezen, tussen welke tijdstippen zou u uw leveringen willen ontvangen?

O voor 9:00
O 9:00 – 11:00
O 11:00 – 13:00
O 13:00 – 15:00
O 15:00 – 18:00
O Avond
O Nacht
O n.v.t.

14.Heeft u een webshop?

O Nee
O Ja

15.Waar bevindt zich de voorraad voor uw webshop?

O Winkel
O Andere locatie
O n.v.t.

16.In welke mate vormen onderstaande aspecten een bijdrage aan uw bedrijfsvoering wat betreft het bundelen?

	Helemaal niet				**Helemaal wel**	**n.v.t.**
Verhoging van de winst	O	O	O	O	O	O
Lagere abonnement kosten	O	O	O	O	O	O
Meer gemak	O	O	O	O	O	O
Groen imago	O	O	O	O	O	O
Minder tijd en moeite	O	O	O	O	O	O
Onmiddellijke beloning	O	O	O	O	O	O

17.In welke mate vormen onderstaande aspecten een bijdrage aan uw bedrijfsvoering wat betreft avondbezorging?

	Helemaal niet				**Helemaal wel**	**n.v.t.**
Verhoging van de winst	O	O	O	O	O	O
Lagere abonnement kosten	O	O	O	O	O	O
Meer gemak	O	O	O	O	O	O
Groen imago	O	O	O	O	O	O
Minder tijd en moeite	O	O	O	O	O	O
Onmiddellijke beloning	O	O	O	O	O	O

18.In welke mate vormen onderstaande aspecten een bijdrage aan uw bedrijfsvoering wat betreft bezorging op een andere dag?

	Helemaal niet				**Helemaal wel**	**n.v.t.**
Verhoging van de winst	O	O	O	O	O	O
Lagere abonnement kosten	O	O	O	O	O	O

Meer gemak	O	O	O	O	O	O
Groen imago	O	O	O	O	O	O
Minder tijd en moeite	O	O	O	O	O	O
Onmiddellijke beloning	O	O	O	O	O	O

19.In welke mate vormen onderstaande aspecten een bijdrage aan uw bedrijfsvoering wat betreft expres bezorging?

	Helemaal niet				**Helemaal wel**	**n.v.t.**
Verhoging van de winst	O	O	O	O	O	O
Lagere abonnement kosten	O	O	O	O	O	O
Meer gemak	O	O	O	O	O	O
Groen imago	O	O	O	O	O	O
Minder tijd en moeite	O	O	O	O	O	O
Onmiddellijke beloning	O	O	O	O	O	O

20. In welke mate vormen onderstaande aspecten een bijdrage aan uw bedrijfsvoering wat betreft het ophalen van droog afval?

	Helemaal niet				**Helemaal wel**	**n.v.t.**
Verhoging van de winst	O	O	O	O	O	O
Lagere abonnement kosten	O	O	O	O	O	O
Meer gemak	O	O	O	O	O	O
Groen imago	O	O	O	O	O	O
Minder tijd en moeite	O	O	O	O	O	O
Onmiddellijke beloning	O	O	O	O	O	O

21.In hoeverre sluiten de onderstaande services aan op uw huidige werkzaamheden?

	Helemaal niet				**Helemaal wel**
Bundelen	O	O	O	O	O
Avondbezorging	O	O	O	O	O
Bezorging op een andere dag	O	O	O	O	O
Expres bezorging	O	O	O	O	O
Ophalen van droog afval	O	O	O	O	O

22.Hoeveel bent u bereid meer te betalen voor de onderstaande services per rit?

	Niet	**<€1**	**€1 - €2**	**€3 - €4**	**€5 - €6**	**>€6**
Bundelen	O	O	O	O	O	O

Avondbezorging	O	O	O	O	O	O
Bezorging op een andere dag	O	O	O	O	O	O
Expres bezorging	O	O	O	O	O	O
Ophalen van droog afval	O	O	O	O	O	O

23.In welke mate vormen onderstaande aspecten een barrière voor uw bedrijfsvoering wat betreft het bundelen?

	Helemaal niet				**Helemaal wel**	**n.v.t.**
Prijs	O	O	O	O	O	O
Hoeveelheid	O	O	O	O	O	O
Niet geleverd/ bezorgd	O	O	O	O	O	O
Te laat geleverd/ bezorgd	O	O	O	O	O	O
Verkeerd geleverd / bezorgd	O	O	O	O	O	O
Klanten hebben geen behoefte	O	O	O	O	O	O
Landelijk geregeld	O	O	O	O	O	O
Risicovol product	O	O	O	O	O	O

24.In welke mate vormen onderstaande aspecten een barrière voor uw bedrijfsvoering wat betreft avondbezorging?

	Helemaal niet				**Helemaal wel**	**n.v.t.**
Prijs	O	O	O	O	O	O
Hoeveelheid	O	O	O	O	O	O
Niet geleverd/ bezorgd	O	O	O	O	O	O
Te laat geleverd/ bezorgd	O	O	O	O	O	O
Verkeerd geleverd / bezorgd	O	O	O	O	O	O
Klanten hebben geen behoefte	O	O	O	O	O	O
Landelijk geregeld	O	O	O	O	O	O
Risicovol product	O	O	O	O	O	O

25.In welke mate vormen onderstaande aspecten een barrière voor uw bedrijfsvoering wat betreft bezorging op een andere dag?

	Helemaal niet				**Helemaal wel**	**n.v.t.**
Prijs	O	O	O	O	O	O
Hoeveelheid	O	O	O	O	O	O

Niet geleverd/ bezorgd	O	O	O	O	O	O
Te laat geleverd/ bezorgd	O	O	O	O	O	O
Verkeerd geleverd / bezorgd	O	O	O	O	O	O
Klanten hebben geen behoefte	O	O	O	O	O	O
Landelijk geregeld	O	O	O	O	O	O
Risicovol product	O	O	O	O	O	O

26. In welke mate vormen onderstaande aspecten een barrière voor uw bedrijfsvoering wat betreft expres bezorging?

	Helemaal niet				**Helemaal wel**	**n.v.t.**
Prijs	O	O	O	O	O	O
Hoeveelheid	O	O	O	O	O	O
Niet geleverd/ bezorgd	O	O	O	O	O	O
Te laat geleverd/ bezorgd	O	O	O	O	O	O
Verkeerd geleverd / bezorgd	O	O	O	O	O	O
Klanten hebben geen behoefte	O	O	O	O	O	O
Landelijk geregeld	O	O	O	O	O	O
Risicovol product	O	O	O	O	O	O

27.In welke mate vormen onderstaande aspecten een barrière voor uw bedrijfsvoering wat betreft het ophalen van droog afval?

	Helemaal niet				**Helemaal wel**	**n.v.t.**
Prijs	O	O	O	O	O	O
Hoeveelheid	O	O	O	O	O	O
Niet geleverd/ bezorgd	O	O	O	O	O	O
Te laat geleverd/ bezorgd	O	O	O	O	O	O
Verkeerd geleverd / bezorgd	O	O	O	O	O	O
Klanten hebben geen behoefte	O	O	O	O	O	O
Landelijk geregeld	O	O	O	O	O	O
Risicovol product	O	O	O	O	O	O

28.Staat u open voor een testfase voor de onderstaande services?

	Helemaal niet				**Helemaal wel**	**n.v.t.**
Bundelen	O	O	O	O	O	O
Avondbezorging	O	O	O	O	O	O

Bezorging op een andere dag	O	O	O	O	O	O
Expres bezorging	O	O	O	O	O	O
Ophalen van droog afval	O	O	O	O	O	O

29.Zijn er nog andere services waar u behoefte aan heeft als het gaat om goederen vervoer in de binnenstad van Delft?

30.Wilt u in de nabije toekomst gebruik maken van de services van Stadslogistiek Delft?

	Helemaal niet				**Helemaal wel**
Toekomst	O	O	O	O	O

Hartelijk dank voor het invullen van de enquête.

Mocht u nog meer informatie willen over Stadslogistiek Delft, bezoek dan de website: www.stadslogistiekdelft.nl of stuur een e-mail naar info@stadslogistiekdelft.nl

Appendix B

Table 1 *Satisfaction of the current supply*

	Frequency	Percent
Dissatisfied	3	2.1
Neutral	2	1.4
Satisfied	19	13.3
Good	113	79.0
Total	137	95.8
Missing (999)	6	4.2
Total	143	100

Table 2 *Amount of deliveries per week*

	Frequency	Percent
<1	6	4.2
1-2	44	30.8
3-4	25	17.5
5-6	18	12.6
>=7	17	11.9
Total	110	76.9
Missing (999)	33	23.1
Total	143	100

Table 3 *Hinder to work*

	Frequency	Percent
Never	48	33.6
Sometimes	21	14.7
Neutral	7	4.9
Some	5	3.5
Always	4	2.8
Total	85	59.4
Missing (999)	58	40.6
Total	143	100

Table 4 *Webshop*

	Frequency	Percent
No	73	51.0
Yes	70	49.0
Total	143	100

Table 5 *Use of City Logistics in the future*

	Frequency	Percent
Not at all	35	24.5
Not	28	19.6
Neutral	43	30.1
Well	27	18.9
Quite well	10	7.0
Total	143	100

Appendix C

Table 6 *The mean scores of the specifications of relative advantage of the sustainable services*

	Bundling of supplies	Same day delivery	Delivery on another day	Express delivery	Collection of dry waste
Specifications					
Economic profitability	2.277	2.736	2.650	2.759	2.000
Low initial cost	2.269	2.520	2.509	2.578	2.048
Decreased discomfort	2.388	2.664	2.636	2.707	2.102
Social prestige	2.842	2.912	2.898	2.966	2.232
Savings in time and effort	2.395	2.637	2.644	2.724	2.111
Immediacy of reward	2.294	2.720	2.627	2.724	2.024

Factorial analysis on relative advantage

Table 7 *Kaiser-Meyer-Oklin value and Barlett's Test of the attribute relative advantage*

	KMO	Barlett's Test Sig.
Bundling of supplies	0.855	<0.001
Same day delivery	0.872	<0.001
Delivery on another day	0.860	<0.001
Express delivery	0.885	<0.001
Collection of dry waste	0.878	<0.001

Table 8 *The component matrix of the attribute relative advantage*

	Component 1	Component 1	Component 1	Component 1	Component 1
	Bundling of supplies	Same day delivery	Delivery on another day	Express delivery	Collection of dry waste
Economic profitability	0.911	0.929	0.933	0.940	0.980
Low initial cost	0.859	0.901	0.908	0.902	0.988
Decreased discomfort	0.921	0.982	0.985	0.981	0.954
Social prestige	0.614	0.865	0.855	0.863	0.875
Savings in time and effort	0.915	0.973	0.979	0.980	0.953
Immediacy of reward	0.943	0.909	0.944	0.949	0.968

Chronbach's alpha on relative advantage

Table 9 *The chronbach's alpha coefficient of the attribute relative advantage*

	Chronbach's alpha coefficient
Bundling of supplies	0.923
Same day delivery	0.963
Delivery on another day	0.968
Express delivery	0.969
Collection of dry waste	0.978

One-way repeated measures ANOVA on relative advantage

Table 10 *The pairwise comparisons of the attribute relative advantage*

Service	**Other services**	**Mean difference**	**Std. Error**	**Sig.**	**Confidence Interval for difference**	
					Lower Bound	Upper Bound
1	2	-0.208	0.103	0.463	-0.504	0.088
	3	-0.158	0.101	1.000	-0.450	0.133
	4	-0.191	0.106	0.753	-0.496	0.114
	5	0.368*	0.103	0.006	0.070	0.665
2	1	0.208	0.103	0.463	-0.088	0.504
	3	0.050	0.032	1.000	-0.041	0.141
	4	0.017	0.030	1.000	-0.070	0.104
	5	0.576*	0.104	<0.001	0.277	0.874
3	1	0.158	0.101	1.000	-0.133	0.450
	2	-0.050	0.032	1.000	-0.141	0.041
	4	-0.033	0.023	1.000	-0.099	0.034
	5	0.526*	0.103	<0.001	0.229	0.823
4	1	0.191	0.106	0.753	-0.114	0.496
	2	-0.017	0.030	1.000	-0.104	0.070
	3	0.033	0.023	1.000	-0.034	0.099
	5	0.558*	0.107	<0.001	0.250	0.867
5	1	-0.368*	0.103	0.006	-0.665	-0.070
	2	-0.576*	0.104	<0.001	-0.874	-0.277
	3	-0.526*	0.103	<0.001	-0.823	-0.229
	4	-0.558*	0.107	<0.001	-0.867	-0.250

Note. $^{+}p < 10$; *p < 0.05; **p < 0.01; ***p < 0.001.

Appendix D

Table 11 *Compatibility of the sustainable services*

	Bundling of supplies		***Same day delivery***		***Delivery on another day***		***Express delivery***		***Collection of dry waste***	
	Freq.	***%***	***Freq.***	***%***	***Freq.***	***%***	***Freq.***	***%***	***Freq.***	***%***
Strongly disagree	*92*	*64.3*	*86*	*60.1*	*90*	*62.9*	*90*	*62.9*	*105*	*73.4*
Disagree	*23*	*16.1*	*20*	*14.0*	*26*	*18.2*	*22*	*15.4*	*17*	*11.9*
Neutral	*13*	*9.1*	*7*	*4.9*	*7*	*4.9*	*7*	*4.9*	*10*	*7.0*
Agree	*10*	*7.0*	*16*	*11.2*	*13*	*9.1*	*15*	*10.5*	*5*	*3.5*
Strongly agree	*5*	*3.5*	*14*	*9.8*	*7*	*4.9*	*9*	*6.3*	*6*	*4.2*

One-way repeated measures ANOVA on compatibility

Table 12 *The pairwise comparisons of the attribute compatibility*

Service	**Other services**	**Mean difference**	**Std. Error**	**Sig.**	**Confidence Interval for difference**	
					Lower Bound	Upper Bound
1	2	-0.273	0.151	0.728	-0.703	0.158
	3	-0.056	0.136	1.000	-0.445	0.333
	4	-0.126	0.143	1.000	-0.535	0.283
	5	0.161	0.103	1.000	-0.133	0.454
2	1	0.273	0.151	0.728	-0.158	0.703
	3	0.217*	0.067	0.014	0.027	0.407
	4	0.147*	0.050	0.036	0.005	0.288
	5	0.434*	0.139	0.022	0.038	0.829
3	1	0.056	0.136	1.000	-0.333	0.445
	2	-0.217*	0.067	0.014	-0.407	-0.027
	4	-0.070	0.058	1.000	-0.237	0.097
	5	0.217	0.126	0.875	-0.142	0.576
4	1	0.126	0.143	1.000	-0.283	0.535
	2	-0.147*	0.050	0.036	-0.288	-0.005
	3	0.070	0.058	1.000	-0.097	0.237
	5	0.287	0.133	0.328	-0.093	0.666
5	1	-0.161	0.103	1.000	-0.454	0.133
	2	-0.434*	0.139	0.022	-0.829	-0.038
	3	-0.217	0.126	0.875	-0.576	0.142
	4	0.287	0.133	0.328	-0.666	0.093

Note. $^{+}p < 10$; *p < 0.05; **p < 0.01; ***p < 0.001.

Appendix E

Table 13 Mean scores of the specifications of *complexity of the sustainable services*

	Bundling of supplies	Same day delivery	Delivery on another day	Express delivery	Collection of dry waste
Specifications					
Price	4.505	4.343	4.354	4.347	4.319
Quantity	4.299	3.418	3.453	3.446	3.892
Not supplied/ delivered	3.671	3.642	3.656	3.646	3.316
Not supplied/ delivered in time	3.764	4.191	3.719	3.697	3.342
Incorrect supplied/ delivered	3.699	3.642	3.656	3.646	3.316
No need from my clients	2.952	4.174	4.976	4.235	3.231
Nationally arranged	4.280	4.614	4.614	4.489	4.341
High risk product	4.413	4.420	4.404	4.511	3.095

Factorial analysis on complexity

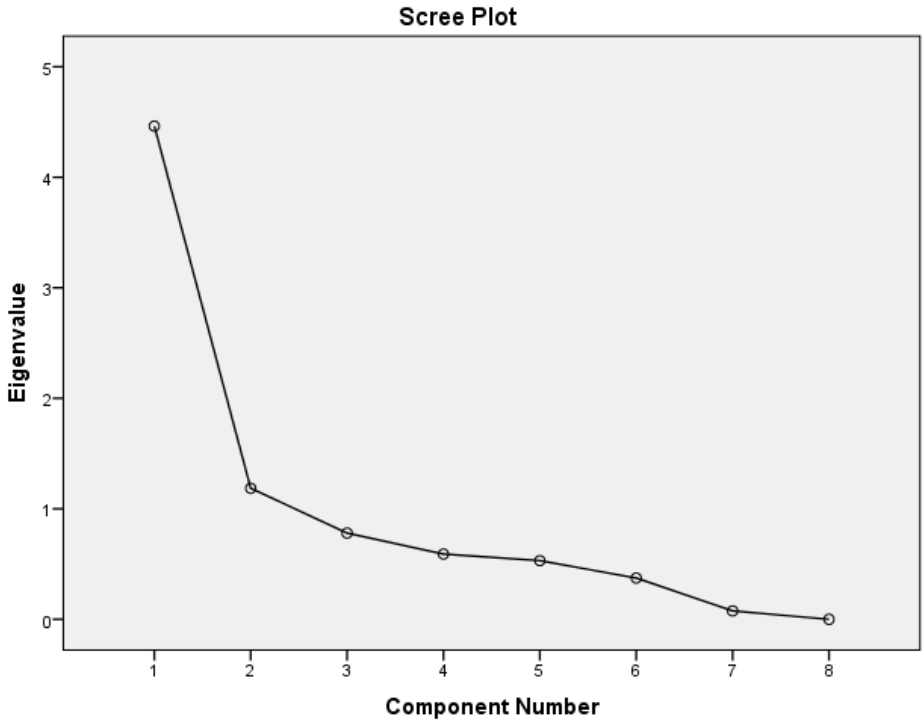

Figure 1 *Scree plot of the attribute complexity and the service same day delivery*

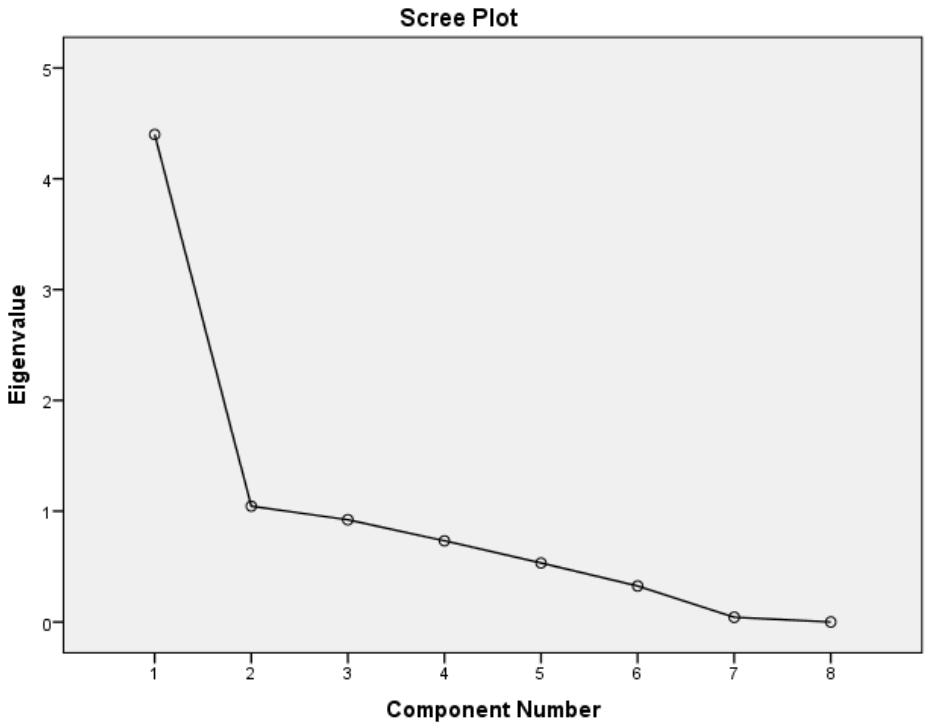

Figure 2 *Scree plot of the attribute complexity and the service delivery on another day*

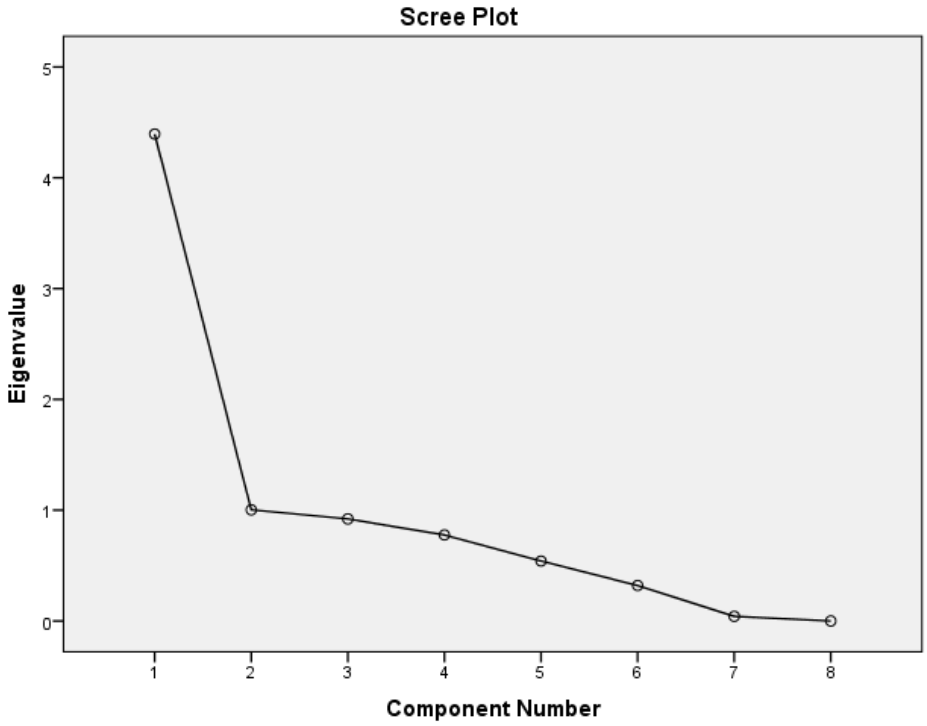

Figure 3 *Scree plot of the attribute complexity and the service express delivery*

Table 14 *The pattern matrix of the attribute complexity*

	Bundling of supplies	**Same day delivery**		**Delivery on another day**		**Express delivery**		**Collection of dry waste**
Component		1	2	1	2	1	2	
Specifcations								
Price	-	0.554		0.792		0.696		-
Quantity	-	0.727		0.703		0.719		-
Not supplied/ delivered	-	0.964		0.938		0.952		-
Not supplied/delivered in time	-	0.967		0.941		0.953		-
Incorrect supplied/delivered	-	0.964		0.938		0.952		-
No need from clients	-		0.530		-0.503			-
Nationally arranged			0.905		0.863		0.980	
High risk product			0.589	0.605		0.551		

Chronebach's alpha on complexity

Table 15 *The chronbach's alpha coefficient of the attribute complexity*

	Chronbach's alpha coefficient
Bundling of supplies	0.734
Same day delivery	0.851
Delivery on another day	0.848
Express delivery	0.855
Collection of dry waste	0.435

One-way repeated measures ANOVA on complexity

Table 16 *The pairwise comparisons of component 1: supplies/deliveries*

Service	Other services	Mean difference	Std. Error	Sig.	Confidence Interval for difference	
					Lower Bound	Upper Bound
1	2	-0.011	0.011	0.976	-0.038	0.017
	3	-0.011	0.011	0.976	-0.038	0.017
2	1	0.011	0.011	0.976	-0.017	0.038
	3	0.000	0.000	-	0.000	0.000
3	1	0.011	0.011	0.976	-0.17	0.038
	2	0.000	0.000	-	0.000	0.000

Note. $^{+}p < 10$; *p < 0.05; **p < 0.01; ***p < 0.001.

Table 17 *The pairwise comparisons of component 2: external factors*

Service	Other services	Mean difference	Std. Error	Sig.	Confidence Interval for difference	
					Lower Bound	Upper Bound
1	2	-0.079	0.058	0.560	-0.231	0.073
	3	-0.026	0.026	0.992	-0.096	0.043
2	1	0.079	0.058	0.560	-0.073	0.231
	3	0.053	0.053	0.992	-0.086	0.192
3	1	0.026	0.026	0.992	-0.043	0.096
	2	-0.053	0.053	0.992	-0.192	0.086

Note. $^{+}p < 10$; *p < 0.05; **p < 0.01; ***p < 0.001.

Appendix F

Table 18 *Trialability of the sustainable services*

	Bundling of supplies		Same day delivery		Delivery on another day		Express delivery		Collection of dry waste	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Strongly disagree	86	60.1	73	51.0	79	55.2	77	53.8	91	63.6
Disagree	27	18.9	29	20.3	32	22.4	31	21.7	25	17.5
Neutral	18	12.6	20	14.0	20	14.0	20	14.0	16	11.2
Agree	8	5.6	10	7.0	5	3.5	8	5.6	5	3.5
Strongly agree	1	0.7	9	6.3	4	2.8	4	2.8	2	1.4
Missing (999)	3	2.1	2	1.4	3	2.1	3	2.1	4	2.8

One-way repeated measures ANOVA on trialability

Table 19 *The pairwise comparisons of the attribute trialability*

Service	Other services	Mean difference	Std. Error	Sig.	Confidence Interval for difference	
					Lower Bound	Upper Bound
1	2	-0.326	0.117	0.060	-0.660	0.007
	3	-0.123	0.102	1.000	-0.414	0.168
	4	-0.167	0.106	1.000	-0.470	0.136
	5	-0.036	0.079	1.000	-0.188	0.261
2	1	0.326	0.117	0.060	-0.007	0.660
	3	0.203*	0.069	0.039	0.006	0.400
	4	0.159*	0.051	0.020	0.015	0.304
	5	0.362*	0.115	0.019	0.036	0.689
3	1	0.123	0.102	1.000	-0.168	0.414
	2	-0.203*	0.069	0.039	-0.400	-0.006
	4	-0.043	0.047	1.000	-0.178	0.091
	5	0.159	0.098	1.000	-0.121	0.440
4	1	0.167	0.106	1.000	-0.136	0.470
	2	-0.159*	0.051	0.020	-0.304	-0.015
	3	0.043	0.047	1.000	-0.091	0.178
	5	0.203	0.102	0.496	-0.089	0.495
5	1	-0.036	0.079	1.000	-0.261	0.188
	2	-0.362*	0.115	0.019	-0.689	-0.036
	3	-0.159	0.098	1.000	-0.440	0.121
	4	-0.203	0.102	0.496	-0.495	0.089

Note. $^{+}p < 10$; *p < 0.05; **p < 0.01; ***p < 0.001.

Appendix G

Table 20 *Willingness to pay of the sustainable services*

	Bundling of supplies		***Same day delivery***		***Delivery on another day***		***Express delivery***		***Collection of dry waste***	
	Freq.	***%***	***Freq.***	***%***	***Freq.***	***%***	***Freq.***	***%***	***Freq.***	***%***
Not	135	94.4	130	90.9	*136*	*95.1*	*134*	*93.7*	*138*	*96.5*
<€1	1	0.7	1	0.7	-	-	-	-	-	-
€1 - €2	5	3.5	3	2.1	2	1.4	2	1.4	3	2.1
€3 - €4	2	1.4	2	1.4	1	0.7	2	1.4	1	0.7
€5 - €6	-	-	7	4.9	4	2.8	4	2.8	1	0.7
>€6	-	-	-	-	-	-	1	0.7	-	-