

Service delivery pricing in E-fulfillment

“The influence of shipping fees on consumer preferences in the last mile”

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Master's thesis

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Yours truly,

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Management summary

This thesis describes a study on delivery options in e-fulfillment, the impact on logistics handling, consumer preferences and the effect of price on consumer behavior in e-fulfillment.

This study examined the Dutch market, regarding delivery location and delivery speed. With respect to delivery speed, most web shops offer 24-hour delivery and regarding location, the majority of the web shops offer home delivery.

The impact of delivery options on logistics handling can be divided in increased transport movements and increasing operational peaks in warehouses. Considering the trend of increasing Internet sales, transport movements are likely to increase because every order needs to be delivered. Because consumers order relatively much during the weekend, web shops mostly face operational peaks on Mondays. As a result of these peaks, web shops might not be able to deliver within 24 hours, which could possibly lead to the loss of customers. Furthermore, transport movements are likely to increase congestion and pollution and due to higher fuel prices it will be more expensive to deliver an order to the customer.

In this research we studied what preferences consumers have regarding delivery speed and delivery locations. Regarding delivery speed, findings showed consumers prefer to receive their order within 24 hour as compared to a 2-5 day lead-time. With regard to delivery location, consumers prefer home delivery over a pick-up. When consumers do prefer pick-up, 59% indicate to be willing to pick-up in store and 70% indicate to be willing to pick-up at a central service point.

Results on the effect of shipping fees showed that consumers are willing to pay up to € 2 more for a delivery within 24 hours, as compared to a delivery within 2-5 days. Above a € 2 difference, consumers are found to choose for a lower delivery speed. Furthermore up to € 4 would be paid more for a home delivery as compared to a pick-up of the order. Again, above € 4 consumers are found to choose for pick-up instead of home delivery.

Shipping fees thus affect consumer behavior in the last mile of e-fulfillment. Therefore web shops are able to control operational peaks in warehouses. The effect of shipping fees also enables web shops to control increased transport movements.

Management samenvatting

In deze scriptie is onderzoek uitgevoerd naar de verschillende afleveropties in e-fulfillment met betrekking tot afleversnelheid en afleverlocatie. Daarnaast is de impact van afleversnelheid en afleverlocatie onderzocht. Tevens zijn consumentenvoorkeuren in kaart gebracht en is de invloed van verzendkosten op consumentenkeuzes in ‘the last mile’ onderzocht.

Onderzoek naar de verschillende afleversnelheden en afleverlocaties is gedaan voor de Nederlandse markt. Met betrekking tot de leversnelheid, leveren de meeste web shops de orders binnen 24 uur. Met betrekking tot de locatie bieden de meeste web shops thuislevering aan.

De impact van deze afleveropties op de logistieke afhandeling is; toenemende operationele pieken in magazijnen en toenemende transportbewegingen. Wanneer we kijken naar de trend van toenemende internet verkoop is het aannemelijk dat het aantal transportbewegingen ook zullen stijgen. Omdat consumenten relatief veel bestellen in het weekend zien web shops vooral op maandag een toenemende operationele piek in hun magazijnen. Als gevolg van toenemende operationele pieken is het mogelijk dat web shops niet meer binnen de beloofde 24 uur kunnen leveren. Dit heeft mogelijk klantverlies tot gevolg.

Consumenten geven de voorkeur aan levering binnen 24 uur in plaats van levering binnen 2-5 dagen en geven de voorkeur aan thuislevering in plaats van ophalen bij een winkel of centraal afhaalpunt. Wanneer de consumenten ervoor kiezen om af te halen, geeft 59% aan dat afhalen in de winkel een gewenste optie is. Voor afhalen bij een centraal afhaalpunt geeft 70% van de consumenten aan dit een gewenste optie te vinden.

De resultaten in deze scriptie laten zien dat verzendkosten invloed hebben op de keuzes die consumenten maken voor afleversnelheid en afleverlocatie. Wat betreft de afleversnelheid kiezen consumenten in plaats van levering binnen 24 uur voor levering binnen 2-5 dagen. Dit effect vindt plaats wanneer de verzendkosten van de afleveropties meer dan € 2 van elkaar verschillen. Betreffende de afleverlocatie kiezen consumenten voor het afhalen van het product in plaats van thuis te laten leveren. Dit effect vindt plaats wanneer de afleveropties meer dan € 4 van elkaar verschillen.

Verzendkosten hebben invloed hebben op het consumentengedrag en de keuzes die consumenten maken met betrekking tot de aflevermogelijkheid. Dit biedt web shops de mogelijkheid om toenemende operationele pieken af te vlakken. Daarnaast kunnen door middel van verzendkosten ook toenemende transportbewegingen worden tegengegaan.

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1 Introduction

1.1 Research background

The last decade, online shopping has grown extensively, and the next ten years, an increase of internet sales from 4%-10% to 25%-30% is also expected (Capgemini, 2009).

The overall growth and adoption of information technologies, provides consumers a transparent scale of products, i.e., a web-based service economy (Capgemini, 2011).

The American bank Goldman Sachs investigated the increase on worldwide internet sales, and stated that in 2013, around \$963 billion will be spend on worldwide internet sales (Sachs, 2011).

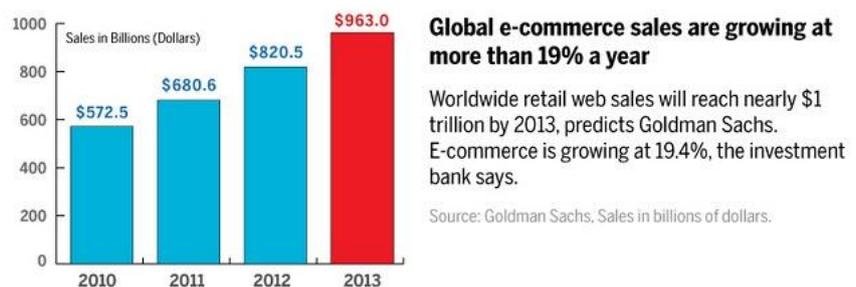


Figure 1: E-commerce sales (GoldmanSachs, 2011)

By the year 2014, around two billion consumers worldwide will have made a transaction with their smart phones. This means an increase in Internet sales and an increase in transport movements to deliver the order at the consumer. In the Netherlands, in the first half of 2012 consumers spent € 4.6 billion online, which is an increase of 9% compared to the previous year (CBS, 2012).

Nowadays many traditional retailers offer their goods via an Internet channel (Ehmke and Mattfeld, 2011). Traditional retailers, who offer their goods via traditional stores and via Internet, are called multi-channel retailers (Burt and Sparks, 2003). Growing sales and consumer behavior will cause different challenges for Internet retailers and logistic services providers. Consumers are able to compare retailer's products, prices and services online with minimal time and effort. This is possible because the consumer can easily switch to a competitors website (Carlson and O'Cass, 2010). Hence, these developments will increase competition and therefore Internet retailers are obliged to reduce costs and retain their service levels.

E-companies must deliver superior service experiences to their customers, if they want to earn their businesses, their repeat patronage, and eventually their loyalty. After all, poor service quality has been shown to account for 80 percent customer complaints about e-tailers. To retain consumers, online retailers should focus on offering high quality products and services, which includes the fulfillment service of purchased goods (Rao, 2011). In fact, it has been argued that order fulfillment is the most critical operation for Internet retailers and that online retailers who outperform competition have much to gain (De Koster, 2003). This is consistent to the more recent findings of Rao (2011) who found the operations management in e-fulfillment to play a critical role in an online retailer's success.

Ordering today and getting delivered tomorrow is a well-known slogan that appears on many online web shops. As a consequence, e-tailers face operational peaks at the first workday of the week. Moreover, on average 40% of the total weekly orders is processed during the weekend, causing operational peaks on Mondays at the retailer and peaks on Tuesdays for the third party logistics (Weinschenk, 2012). We can therefore question consumer preferences with regard to the way they want to be delivered. DeliveryMatch (2011) shows that most consumers prefer home-delivery within 24 hours. Therefore, the question arises whether these preferences are maintained when higher prices are charged for these services. This thesis will therefore study the effect of pricing on several service delivery options and whether this differs between product groups and consumer segments.

This thesis will consider multi-channel retailers within the Netherlands. The focus will be on pricing of the physical delivery part of e-fulfillment, also known as ‘the last mile’. We will investigate the effect of pricing on the choice of physical delivery methods and whether it is possible for e-tailers to manage demand.

In the next section the main research question and the sub-questions are presented.

1.2 Research gap

For traditional retailers, Friday is the busiest day of the week, whereas e-tailers have their busiest day on Monday, because consumers order relatively much during the weekend (ING, 2011). ING (2011) studied the changes of physical distribution in the Dutch e-commerce market. They interviewed several Dutch logistic service providers and found a shift from operational peaks on Fridays towards Mondays.

To manage demand in e-fulfillment Agatz (2009) distinguishes two different demand management levers for e-fulfillment, namely capacity allocation (slotting) and pricing. The research of Agatz focuses primarily on time-slot management decisions, this leaves room for future research on pricing to influence demand.

Dynamic pricing can affect the demand real-time (Garbarino and Lee, 2003). Netessine et al. (2006) have conducted a study on revenue management through dynamic cross-selling in e-commerce. Although revenue management has been adopted by many industries, this is still mainly applied to airline ticket sales. A more recent study was conducted by Yao and Zhang (2012), who studied the effect of pricing for shipping services. Their main focus was on how price charges are related to on-time delivery and whether e-tailers increase their price when the distance to the delivery address is larger.

Despite these meaningful studies, hardly any research has been conducted on the willingness to pay for specific service delivery, like lead-time choices, and pick-up or delivery choices. Thus far, some commercial studies were conducted in the Netherlands, with regard to consumer preferences to receive a product at home, within 24 hours (DeliveryMatch, 2011). However, these studies did not consider paying certain shipping fees. This then leads to additional questions like: Do consumer preferences change with higher shipping fees for 24-hour delivery? And can these fees positively change the influence on operational peaks and logistics handling in e-fulfillment? Furthermore, are consumers willing to pick-up their products instead of a home-delivery when this affects shipping fees? And how does this affect the supply chain? To answer these questions, this research focuses on the effect of shipping fees on delivery speed and delivery location.

1.3 Problem definition and research questions

To gain more insight in the effect of shipping fees on consumer preferences, the main research question is:

“How do shipping fees influence consumer behavior in various consumer segments on the choice of delivery in e-fulfillment between different product groups?”

At this research question, there are four sub-questions, supporting the main research question:

- 1. According to the literature, what are delivery and shipping fee options in e-fulfillment with respect to different delivery speeds and delivery locations?*
- 2. According to the literature, what is the impact of delivery options on logistics handling in e-fulfillment with respect to delivery speed and delivery location?*
- 3. Which preferences for delivery options do consumers have and how do they differ between consumer segments and product groups?*
- 4. How do shipping fees influence consumer preferences for delivery options and how does this vary between consumer segments and product groups?*

1.4 Theoretical and managerial contribution

This paper contributes to the existing literature in two ways. First, based on this research we gain more insights on how pricing affects consumer choices on delivery mode within the last mile of e-fulfillment.

The concept of consumer choices on delivery mode contains both economical and psychological factors, therefore this study helps to create a better understanding of how consumer preferences are affected by price, in terms of shipping fees.

Addressing this issue from a supply chain perspective is both novel and important; Internet sales are expected to increase, leading to higher operational peaks and transport movements, which can in turn affect both environmental and financial performance of web shops (Agatz, 2009; Yao and Zhang, 2012; Rao, 2011; Weinschenk, 2012; Capgemini, 2011). As Agatz (2009) posits in his research recommendations, the effects of shipping fees on lead-time preference and channel choice in e-fulfillment have not been captured sufficiently in order to handle operational peaks and environmental concerns.

Second, this study will provide insights on the attractiveness of different delivery services and how this differs between product- and consumer-groups in the Dutch market.

1.5 Thesis structure

This paper is structured as followed; chapter 2 starts with an overview of the available literature within this research area. This theoretical framework forms a basis for the hypotheses and model to be tested. Chapter 3 describes the methodology of this study. In chapter 4 the empirical results are presented. Finally, chapter 5 describes the conclusion, limitations and recommendations for future research.

2 Theoretical framework & Hypotheses

2.1 Delivery options in e-fulfillment

In this section, the delivery options in the last mile of e-fulfillment are presented. We specifically focus on delivery locations and delivery speed. In this section also the shipping fees are given with respect to different delivery locations and delivery speeds. Research on delivery time is performed by (Hosseinzadeh, 2013). At the end of this chapter the first sub-question will be answered:

1. According to the literature, what are delivery and shipping fee options in e-fulfillment with respect to different delivery speeds and delivery locations?

2.1.1 Delivery location

During the last decade, the Internet has created a retail and consumer revolution by providing a new, convenient channel for shopping. The online retail market is growing rapidly and covers a large line of products and services. Order fulfillment in electronic Business to Consumer (B2C) transactions is a complex, multi-faceted process that will continue to strain the growth of e-commerce in the United States and abroad. In online retailing, the fulfillment process can be understood to consist of three stages: order acceptance, order selection, and order delivery (Boyer and Hult, 2009).

The delivery of products, also known as 'last mile delivery', can be divided in home delivery and pick-up.

Home delivery

From a consumer service perspective, concepts for bridging the 'last mile' to the consumer can be divided into consumer pick-up versus (home) delivery (Daduna and Lenz, 2004). The latter can be further subdivided into attended and unattended delivery (Kämäräinen and Punakivi, 2002). Unattended delivery increases delivery flexibility, and is only applicable for products that can be safely deposited, e.g., in the consumer's mailbox. Attended home-delivery however decreases delivery flexibility, for example, refrigerators and other white goods, needing special handling and fixing care. To examine the most common delivery options in the Netherlands, consumer research performed by DeliveryMatch (2011) and Thuiswinkel.org (2012) was studied. Both sources are not scientific. However, they give a clear and trustful overview by performing empirical research on 150 web shops in the Netherlands and comparing those results to previous years. Moreover, DeliveryMatch and VU University both collaborated in research on e-fulfillment (Logistiek.nl, 2012).

The main advantage of home delivery is the convenience of not handling the last mile yourself. Disadvantages are waiting at home, delivery failures, and delivery fees, as well as problems with returning the goods. The price of shipping fees are a decisive factor which can affect this option.

Pick-up

When ordering online, consumers can also choose to pick-up their orders. Here, customers travel the last mile to pick-up the order themselves. Several options are possible to pick-up the products. The most common pick-up locations are in a store, a petrol station or a post office (Weltevreden, 2008). Weltevreden (2008) studied the rise of central pick-up locations in the Netherlands and its effect on retailers, shopping centers and mobility. He found that central pick-up locations are mainly used for returning orders. When stores are easy accessible, they can also be used as central collection points, where only the store needs to be supplied and the last mile will be handled by the consumer. The critical point for picking-up the order at a specific point, is at a driving distance of five minutes by car.

As mentioned previously, consumers are willing to pick-up the product in a store or a central pick-up location, when these stores are close to the living area of the consumers. It could be, that more pick-up options and locations increases the consumer's willingness to pick-up the goods instead of using home delivery.

DeliveryMatch (2011) examined web-shops (53%) and multi-channel retailers (47%). They found that web shops mainly offer delivery services, whereas the small multi channel retailers mostly offer an alternative pick-up point. The bigger multi-channel retailers mostly use their own physical shops as possible pick-up points. Wang (2011) found multi-channel retailers in Taiwan mostly offering pick-up in store and pick-up at a convenience store. An overview of the amount of pick-up locations per web shop in the Dutch market is shown in Appendix B.

The main advantage for a retailer to offer pick-up is low transportation costs due to the use of the existing network (Chopra, 2003). However, this demands high consumer effort but no fees to be paid by the consumer. Picking-up the order yourself requires effort and travel time to the store which can be seen as an inconvenience. The inconvenience of picking up the order, could be decreased by extra services that are available in a store. For example, people can give advice and provide consumers with stock and assortment information. Furthermore, consumers have the ability to touch and see the product directly. Last, returning the good is also easier.

2.1.2 Delivery speed

Web shops offer a broad assortment of products, but when it comes to home delivery options, most e-tailers only offer one specific carrier.

The study of DeliveryMatch (2011) showed that only some e-tailers offer the option to choose which carrier delivers the order (i.e., Bijenkorf.nl and Nespresso.com).

DeliveryMatch (2011) shows that most e-tailers offer a delivery lead-time of 24 hours, the rest offer a lead-time of 2-5 days (for an overview see Appendix B).

Relatively new is the use of time-slot delivery (Agatz, 2009): consumers can choose a fixed date or a specified time-slot (i.e. 4 hour time-slot).

When consumers choose to pick-up their orders in-store, the lead-times depend on the replenishment strategy of the retailers. Based on this strategy, the products can be delivered in-store within 24 hours, within 2-5 days, or can be picked-up the same day (Weltevreden, 2008).

Another determinant that needs to be considered is the cut-off time. To use specific services, web shops work with cut-off times. Cut-off times are the ultimate ordering time to use a specific service. In traditional distribution centers, consumers can mostly order up-on the early afternoon, to get receive the product the next day. Cut-off times are mostly concentrated around 01:00 PM, so that orders can be picked and send that same day. Nowadays, most web shops allow orders to be placed up to 10:00 PM, where the order is picked the same evening and send to the customer by night express (Weinschenk, 2012). Research of Dinalog (2013) and Twinklemagazine.nl (2012a) shows an increasing trend in the Dutch market on delaying cut-off times to the late evening. This is one of the effects due to the change in consumer behavior (PWC, 2009).

2.1.3 Shipping fees

Delivery services are often segmented to the lead-time preferences of the consumer (Daduna and Lenz, 2004), for example whether consumers prefer next day delivery or a 2-5 day lead-time. Consumers are possibly willing to pay more for next day delivery than for a 2-5 day lead-time. As Goebel et al. (2012) point out in their research, consumers who perceive a delivery service as more valuable are willing to pay more for the service. In this research, 24-hour delivery speed would perceive to have more value than 2-5 days delivery speed. DeliveryMatch (2011) found that web shops offer different delivery prices. The average shipping fee for home delivery is € 4,95. In addition, sometimes free delivery is offered when certain criteria are met, like when a specific amount is spend.

The majority of the web shops, offer pick-up services, and do not charge any fees for picking-up the goods. Few web shops however do charge a fee in terms of administration costs, like the Dutch web shop Blokker, charging € 0,50 per pick-up order.

Summary

Next, and based on previous description, the following sub-question will be answered:

1. According to the literature, what are delivery and shipping fee options in e-fulfillment with respect to different delivery speeds and delivery locations?

We can distinguish (home) delivery and the pick-up of goods, and high or low delivery speed. With regard to home delivery, most web shops offer a 24-hour delivery service for orders placed before 10:00 PM. The rest of the web shops mostly offer a 2-5 day delivery service. The average shipping fee for home delivery is € 4,95. With regard to home delivery services, either attended- and unattended home delivery is offered. Highly innovative web shops also offer time-slot delivery, where customers can choose a delivery slot. With regard to pick-up services, we distinguish the pick-up in store and the pick-up at a central service point like a Kiala point. Other central service points are for example postal offices and gas stations. Here, consumers handle the last mile themselves. In-store pick-up is mostly free of costs, whereas a pick-up at a central pick-up point on average costs € 2,50.

Table 1: Main characteristics of delivery options

<i>Characteristics</i>	<i>Delivery options</i>	<i>Consumer advantages</i>	<i>Consumer disadvantages</i>	<i>References</i>
Delivery speed	<i>Same day delivery</i>	<i>Fast delivery</i>	<i>Possibly expensive</i>	DeliveryMatch, 2011
	<i>Next day delivery</i>	<i>Fast delivery</i>	<i>Requires home attendance</i>	Weltevreden, 2008
	<i>Multiple day lead-time</i>	<i>Lower shipping fees</i>	<i>Long lead-time</i>	Agatz, 2009
Delivery location	<i>Home delivery</i>	<i>Convenience</i>	<i>Requires home attendance</i>	Agatz, 2009
	<i>In-store pick-up</i>	<i>Free of charge</i>	<i>Open during day-time</i>	Forman et al., 2009
	<i>Central pick-up point</i>	<i>Flexibility in pick-up time/location</i>	<i>Not suitable for all products</i>	Weltevreden, 2008
Shipping fees	Free	<i>Free shipping</i>	<i>Fixed delivery option</i>	DeliveryMatch, 2011
	Free above minimum order quantity	<i>Free shipping</i>	<i>Requires minimum order quantity</i>	DeliveryMatch, 2011
	Fee	-	<i>Possibly expensive</i>	Daduna and Lenz, 2004

2.2 The impact of delivery options on logistics handling

Section 2.1 described different delivery options. From this point we specifically focus on delivery speed and delivery locations. This section therefore will not deal with shipping fees. Section 2.4 describes the influence of shipping fees. Next, the impact of different delivery locations and delivery speeds will be given and sub-question 2 will be answered:

2. According to the literature, what is the impact of delivery options on logistics handling in e-fulfillment with respect to delivery speed and delivery location?

E-fulfillment, the actual delivery of physical goods to the consumer, is mostly described as one of the most expensive and critical operations of Internet sellers (de Koster, 2002a, Lummus and Vokurka., 2002). Economies of scale from the integration of multiple channels need to be weighed against specific requirements of each individual channel. More specifically, the economics of Internet sales tend to differ from those of other channels due to small, single-order transaction sizes. Companies therefore need to make trade-offs when they decide which processes to integrate across channels and which processes to separate (Agatz, 2009). For Internet sales, delivery is a key service element. Most companies adapt their service processes to individual consumer needs, which underlines the importance of coordinating marketing promises and operations capabilities.

2.2.1 Delivery location

The last mile is considered as one of the most expensive, least efficient and most polluting sections of the entire supply chain (Gevaers et al., 2011). One of the foremost problems here, is that people are not at home, when the goods are delivered, which leads to complex planning within that last mile. However, the functionality of home delivery is crucial for online shopping business models and is a key factor for economic success. Another factor that affects this last mile is returning products.

The return stream of Internet sales is quite high because consumers are not able to try and touch the product beforehand. For example, online apparel retailers experience return rates up to 45% of their total orders (Tarn et al., 2003). The costs for bridging the last mile for the second time, can easily be eradicated (Min et al., 2006). The design of an efficient return process is therefore crucial.

The introduction of picking-up the product at a store or at a local pick-up point is a well known alternative for making the consumer responsible for bridging the last mile. To deliver the product to a store or a local pick-up point decreases the amount of transport movements significantly, which also leads to a decrease of transportation costs (Weltevreden, 2008).

Store pick-up points are a fairly common alternative for consumer home delivery; orders are picked and packed in a store where consumers can pick them up (Agatz, 2009).

Because 70% of the world population will probably live in cities by the year of 2020, an explosion of transport movements is expected (Capgemini, 2011). Considering the increase of fuel prices, home-delivery of every single order will increase transportation costs significantly. Steffens (2011) therefore investigates the opportunities for web shops to collaborate in order fulfillment. This is called 'Cross-chain order fulfillment coordination'. When consumers choose to pick-up the products in-store there is an opportunity to see, touch and try the products, which makes returning the goods immediately easier as well (Min et al., 2006). Furthermore pick-up in a store could lead to additional purchases.

In order to allow web shops to decrease peaks during the week, web shops can decide to change their lead-time and to change the delivery service pricing.

2.2.2 Delivery speed

In the traditional distribution centers the biggest peak is on Fridays. At electronic distribution centers this peak is on Mondays, as a result of online consumers ordering relatively much during the weekend (ING, 2011, Roodbergen, 2013). For home delivery, a company and its consumer need to agree on a delivery speed and delivery location. Delivery speed and timing are important aspects of the service consumers perceive. At the same time, this has an immediate impact on the seller's delivery costs. This is even more the case in B2C e-fulfillment operations, which typically involve small pick quantities from a large number of items. These operations are relatively more labor consuming than pallet picking, i.e., where larger amounts of goods are selected.

Cut-off times for next day delivery are mostly concentrated around 01:00 PM. Within E-commerce warehouses, there has been a shift in cut-off times from early in the afternoon to the evening. Most web shops allow orders to be placed up to 10:00 PM. Then, the order is picked the same evening and is send to the consumer by night express (Weinschenk, 2012). To satisfy consumers, not only the requested product has to be available, but there also needs to be sufficient delivery capacity. Based on these factors, the Internet retailer has to commit to a certain lead-time or estimate-to-ship date. Flexibility in the quoted lead-times can help increase e-fulfillment efficiency (Agatz, 2009). Furthermore, retailers have some flexibility with respect to the location where to retrieve the product, as opposed to a physical stock in a traditional retail store.

Because most web shops offer a 24-hour delivery service, peaks occur on Mondays. As a result of those peaks, the amount of employees that are necessary during the week fluctuates. Where web shops face peaks on Mondays, carriers face peaks on Tuesdays. Offering short lead-times is very expensive and requires web shops to have a large stock, to be able to deliver the requested orders in time (Devaraj et al., 2007).

Capacity management and workforce planning correspond with the fulfillment of this service component. In particular, staffing levels need to be adjusted to seasonal demand fluctuations. This includes both delivery and order picking capacity. Since delivery requirements tend to fluctuate more, capacity management of the delivery process appears to be more challenging. For time slot delivery, the impact of demand variation increases with decreasing delivery vehicle capacity. Hsu and Li (2006) seek optimal delivery shipment cycles to find a balance between cost of delivery and customer service in terms of delivery lead-times. Several examples show the advantage of adjusting shipment frequencies to temporal and regional demand variations, rather than imposing a static policy (Agatz, 2009).

Summary

This description contributes to answering sub-question 2:

2. According to the literature, what is the impact of delivery options on logistics handling in e-fulfillment with respect to speed and location?

This section described the impact of fast delivery and home delivery. The effect of 24-hour home delivery on the logistics handling can be divided into high operational peaks and increasing transport movements. Operational peaks in warehouses are mostly on Mondays. Increasing transport movements are due to the delivery of individual orders, instead of creating economies of scale to deliver to stores. As a result, more personal is needed to fulfill all orders and to deliver the orders on time. This impact will probably increase overtime. Moreover, there will be delay in delivery, because it will not be possible to deliver every single order on time when these peaks remain. This could possibly lead to a decrease in the amount of consumers.

The increase in transport movements will lead to congestion, specifically in cities, which will in turn lead to higher fuel costs and more pollution. Table 2 presents an overview of the impact of different delivery options.

Table 2: The impact of delivery options

Characteristics	Delivery options	Effects of delivery options	Enhanced by trend	Results	Reference
<i>Delivery speed</i>	Same day delivery	Demand fluctuations and capacity challenges due to short lead-times.	Consumer service expectations. Increasing Internet sales.	Increasing peaks due to fluctuations in capacity needs for warehousing and delivery. Need of extra employees.	DeliveryMatch, 2011 Devaraj et al., 2007 ING, 2011 Capgemini, 2011
	Next day delivery service	Operational peaks due to delivery speed of 24 hours.	Consumer service expectations. Increasing Internet sales.	More employees needed to fulfill orders during peaks. Possibly late delivery with a risk of losing customers.	Agatz, 2009 DeliveryMatch, 2011 Devaraj et al., 2007 ING, 2011 Capgemini, 2011
	Multiple day lead-time	Less demand fluctuations. Flexibility in warehousing and delivery.	Consumer service expectations. Increasing Internet sales.	Opportunity to decrease peaks and control of trends.	Chopra, 2003 Devaraj et al., 2007
<i>Delivery location</i>	Home delivery service	Increasing transportation movements due to the preference of home delivery.	Increasing urbanicity. Sustainability awareness.	Increased pollution and fuel costs. Possibly late delivery due to congestion. Possibility of losing consumers.	Devaraj et al., 2007 Capgemini, 2011 Gevaers et al., 2011 Tarn et al, 2003
	In-store pick-up	Decreasing transport movements.	-	Effective returns. Possibly decrease in transport costs.	Weinschenk, 2012 Min et al., 2006
	Pick-up at central pick-up point	Decreasing transport movements.	-	Possibly additional sales. Effective returns. Possibly decrease in transport costs.	Weltevreden, 2008 Agatz, 2009

2.3 Consumer preferences on delivery options

In this section, consumer preferences with regard to delivery location and delivery speed will be discussed based on sub-question 3:

3. Which preferences for delivery options do consumers have and how do they differ between consumer segments and product groups?

In previous sections we focused on the physical delivery options of e-fulfillment and the effect on the logistics handling. To exploit the potential of any demand management system, it is crucial to understand consumer behavior (Agatz, 2009). The primary focus of research on satisfaction and preferences is the relationship between performance expectations and satisfaction (Voss et al., 1998).

According to Zeithaml et al. (2002), consumer's predictive expectations directly affect satisfaction assessments. Furthermore, they identify a number of factors – explicit service promises, implicit service promises, word-of-mouth communications and past experience – that affect the predicted service expectations of consumers. These factors cause that individual consumer expectations of the same service vary from one consumer to another. In this particular research, the focus is on consumer expectations of order fulfillment. It is an attempt to understand whether consumer expectations of order fulfillment processes vary across product types and how these expectations affect consumer satisfaction (Thirumalai and Sinha, 2005).

2.3.1 Delivery location

When consumers choose a delivery location, their choices differ on consumer characteristics like convenience or the shipping fee asked for shipping. According to Forman et al. (2009), shipping fees, affect consumers' channel choice. They state that the costs of traveling to a store and the delivery fees of online ordered goods are the main reasons for choosing either a home delivery or a pick-up. Consumer research of Thuiswinkel.org (2009), as presented in Figure 2, show consumers preferences in a cost neutral situation on physical delivery services in the Dutch market.



Figure 2: Delivery location preferences within the Netherlands (Thuiswinkel.org, 2009)

As shown in Figure 2, home-delivery is way more popular than picking-up the product in-store or at a service point. Based on these findings, we propose the following hypothesis:

H1A: Consumers prefer home delivery over pick-up up of their package.

2.3.2 Delivery speed

Nowadays, most web shops (35%) offer a fast delivery, mostly a within 24-hour delivery. Field et al. (2004) found that variables underlying order fulfillment, like speed of delivery and accuracy of delivery, timeliness have a significant positive association with consumer loyalty and therefore increase sales.

Consumer research of Thuiswinkel.org (2011) has shown that consumers believe that it is important, or even very important to deliver goods within 24 hours. Findings showed that the preference of consumers however differs per product group. Some products are needed for several reasons the day after ordering or, in some cases the same day. Another factor that affects the preference for fast delivery is the necessity of the product. Some products are needed for several reasons the day after ordering or, in some cases the same day. Web shop Coolblue offers same day delivery for orders placed before 3:00 PM. The preference for fast delivery, as studied by (DeliveryMatch, 2011), shows an overall preference of delivery within 24 hours.

H1B: Consumers prefer 24-hour delivery over 2-5 days delivery speed.

2.4 Product groups

The next section deals with different product groups and preferences regarding delivery options between these product groups. The definition of Thirumalai & Sinha (2005) will be used, where three different product types are distinguished:

- Convenience goods; "daily necessities", e.g. food, drugstore goods, books, CD's.
- Specialty goods; "high-quality, long-lasting goods", such as furniture and large devices in the brown and white merchandise groups and electronics like personal computers and laptops.
- Shopping goods; "occasional goods", e.g. clothing and shoes.

A product group is an important factor to consider a specific channel in e-fulfillment (Inman et al., 2004). Okada (2005) studied consumer choice of hedonic and utilitarian goods. Hedonic goods are similar to shopping goods like clothing. Utilitarian goods are similar to convenience and specialty goods. Research showed that consumers have a relative preference to pay in time (travel time to store), instead of paying in money for shopping goods and prefer home-delivery for utilitarian goods.

The relative preference to pay in time for shopping goods can be explained by the fact that time expenditures are easier to justify. Results showed that respondents were willing to spend much more time to purchase shopping goods.

The difference between shopping, convenience, and specialty goods can be explained by the combination of time (effort) and money. “In general, consumers pay a premium for convenience or travel a distance as a trade-off” (Okada, 2005).

H2A: There is a difference between product groups regarding the preference of delivery location.

Thirumalai & Sinha (2005) studied consumer satisfaction in e-fulfillment, and they found that the preference of delivery speed is assumed to differ between the three product groups. First, online purchases of convenience goods tend to be in high volumes with a variety of products of low unit costs. Convenience goods are products that consumers tend to purchase frequently and immediately. “Consumers place less value on home delivery and consequently willingness to pay for items that are locally available or are considered commodity or replenishment items” (Newton, 2001). The value of the product and the significance of each individual purchase are low. Consequently, consumer expectations of order fulfillment for convenience goods are likely to be lower than for other product types.

The second product group are the specialty goods. Online purchase of specialty goods such as computers or digital cameras is low in volume (often just one). Consumers tend to purchase these products only after considerable deliberation. Consumer involvement in terms of shopping effort is high. The unit value of the product and the significance of each individual purchase are high. Consequently, consumer expectations of order fulfillment for specialty goods are likely to be relatively higher than for other product types.

The last product group is ‘shopping goods’. Online purchases of shopping goods are in moderate volumes with relatively low variety compared to convenience goods. Consumer involvement in the purchase process, unit value of the product and the significance of each individual purchase are moderate. Consequently, consumer expectations of order fulfillment for shopping goods are likely to be moderate.

The importance of delivery within 24 hours between the product groups is shown in Figure 3. This figure shows how important fast delivery is for the different product groups.

H2B: There is a difference between product groups regarding the preference of delivery speed.

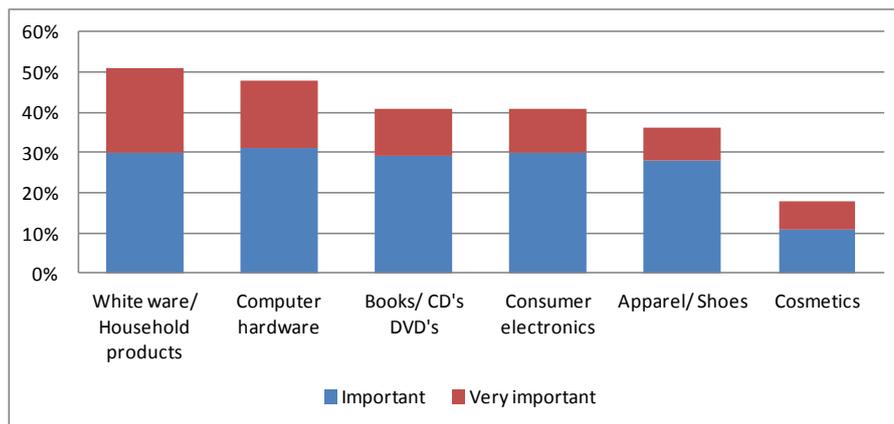


Figure 3: Importance of 24-hour delivery within the Netherlands (Thuiswinkel.org, 2009)

2.5 Shipping fees

This section describes the effect of shipping fees on consumer behavior in e-fulfillment. The hypotheses will be described to test the effect of price on consumer preference for delivery options, which is sub-question 4:

4. *How do shipping fees influence consumer preferences for delivery options and how does this vary between consumer segments and product groups?*

- *Service delivery pricing:* With regard to e-fulfillment, service delivery pricing is known as the shipping fee or the price for delivery of online ordered products. It is a bundled set of charges added to the purchase price of a product. It reflects the costs of physically moving the product from one place to another and it reflects the added value to the consumer of receiving the item within a certain time (Hantula and Bryant, 2005).

Typically, online sellers are able to change prices more easily than traditional retailers. Therefore online sellers can use pricing for short-term demand management (Baker et al., 2001). Hence, an opportunity for multi-channel retailers to manage demand is to apply delivery service pricing, like dynamic shipping fees, instead of the price of the product.

Retailers have several options for designing shipping prices. They can charge nothing (i.e., free-shipping) by subsidizing the shipping cost, they can share the costs with consumers and they can charge shipping fees that are higher than the actual shipping cost to make profit (i.e., profit-shipping).

Empirical evidence of Yao and Zhang (2012) has shown that Internet retailers use all different options. For example, Amazon.com, BN.com, and Buy.com have been practicing a free-shipping policy with a minimum order amount.

Moreover, Wal-Mart.com and Ebay.com have offered free shipping as a competitive strategy. In contrast, CDNow.com applies a profit-shipping policy. CDNow.com charges a price higher than the average cost of shipping a CD: \$3 for the first item shipped and \$1 for each additional item. These shipping charges yield a profit margin (15–20%) similar to the actual CD sale. Other retailers like as Ashford.com, who charge exactly the cost of shipping in order to gain consumers' trust and loyalty (Yao and Zhang, 2012).

Furthermore the study of Yao and Zhang (2012) found that e-tailers increase their base prices when they offer free shipping. E-tailers can strategically determine base and shipping prices to maximize profits. Smith and Brynjolfsson (2010) analyzed online price dispersion and found that consumers are very sensitive for shipping fees and shipping times. Shipping fees significantly affect order incidence as well as basket size.

A study on the Internet book retailing industry showed that sensitive consumers are affected by shipping fees, when considering shipping quality and shipping times (Dinlersoz and Li, 2006). Therefore we might conclude that shipping fees affect consumer's choices and preferences on delivery options.

H3A: Shipping fees influence consumer preferences on delivery options for speed and location.

Schindler et al. (2005) conducted an experiment to show that consumers who are skeptical of shipping charges, prefer a bundled-price format. Consumers who are not skeptical of shipping charges prefer a base price and shipping charge format, but only when they are able to compare an external reference price. Pricing can provide incentives for attracting consumers to decide between delivery alternatives (Agatz, 2009), or -in case of this thesis- between different lead-times and delivery locations. Then, pricing can affect consumer behavior on the pick-up and delivery choices in the last mile. Therefore, we conclude that higher shipping fees affect consumers' decision-making on alternative delivery options.

With regard to the importance of price perception of delivery fees on channel preference, we expect that differences in delivery fees will affect channel preference in the last mile. In case of home-delivery, a specific fee is charged, whereas in-store pick-up is free of charge.

According to Forman et al. (2009), a delivery fee is an online disutility that, together with offline transportation costs, affects consumers' channel choice. They state that the costs of travelling to a store and the delivery fees of online ordered goods are the main factors for choosing between home delivery and pick -up, expressed in monetary values.

Research by Ernst & Young (2011) shows that high delivery fees are the main reason for consumer frustration with online shopping. Consumers do not want to pay high rates for 'normal' shipping services and pick-up should be free of charge. Therefore, price perception of delivery fees is perceived to affect preference for home delivery and in-store pick-up.

As Goebel et al. (2012) point out in their research, consumers who perceive a delivery service as more valuable are willing to pay more for the service. In this study, a 24-hour delivery speed is perceived to be more expensive than a 2-5 days delivery speed. We therefore propose that higher shipping fees on 24-hour delivery speed positively affect the consumer choice for a lower delivery speed or pick-up of the order.

H3B: Shipping fees are positively related to consumer preferences for lower delivery speed.

H3C: Shipping fees are positively related to consumer preferences for pick-up locations.

2.6 Consumer characteristics

Next, consumer characteristics are described and the effects on the preference for delivery location, delivery speed and shipping fees.

Demographics

Different consumers have different expectations and therefore different consumer segments can be divided. Research of Chang et al. (2005) divides consumer segments based on demographics. These demographics include income, age, education and living area.

- *Income, age and education:* Different factors affect whether consumers believe or perceive that a price is low, normal or high. Therefore we divide several consumer segments on their income. Therefore we divide several consumer segments based on their income.

Consumers with an income below average, an average income and an income above average. Based on the figures of CBS (2012), the average modal Dutch gross income is about € 33.000 per year. Consumers with an income above average have are able to buy more and will therefore be less affected by the charge of higher shipping fees than consumers with an average or below average income. It is assumed that a higher income is associated with a higher age and higher education. Research of Jones et al. (1994) showed that low-income shoppers are more price-sensitive than high-income shoppers.

- *Living area:* Where a consumer lives, can be determined geographically, and can be divided in rural areas and urbanized areas.

Consumers in rural areas have to travel longer to arrive at a store than consumers in urbanized areas, because urbanized areas are more dense when it comes to shopping facilities (Farag et al., 2007).

Farag et al. (2007) concluded that shop accessibility positively affected online buying. The more shops a consumer can reach within 10 minutes, the less often one searches online for products, but the more someone buys online. After the order is placed, consumers in urbanized areas are more willing to pick-up the product. Huang and Oppewal (2006) studied the effect of distance to a store and related this to shipping fees. Results indicated that a difference of fifteen minutes in travel time had a greater effect on the relative preference for shopping online or in-store than a delivery fee of £5. Thus, travel time or distance to a store has a significant effect on delivery option preference. Therefore, we might conclude that there is a difference between consumers in dense urbanized areas and consumers in rural areas.

H4A: There is difference between demographic groups (including income, age, education and living place) on the stated preference of delivery speed.

H4B: There is a difference between demographic groups (including income, age, education and living place) on the stated preference of delivery location.

H4C: There is a difference between demographic groups (including income, age, education and living place) in the effect of shipping fees on the preferences for the delivery location.

H4D: There is a difference between demographic groups (including income, age, education and living place) in the effect of shipping fees on the preferences for the delivery speed.

Psychographics

The literature of Balasubramanian et al. (2005) differentiates economical and psychological factors. Economical factors affect channel choice by price, and psychological factors affect channel choice by personality, values and lifestyles. The underlying psychographic factors in this study are ‘household attendance’ and ‘value of time’.

- *Household attendance:* When there is always someone at home, and thus the household is attended, the postal service is highly successful in delivering the product (Goebel et al., 2012). As an effect of having a high household attendance, consumers prefer to receive the product the next day (Twinklemagazine.nl, 2012b). Consumers with a low household attendance would prefer to pick-up the orders.
- *Value of time (VOT):* Value of time is often one of the psychological factors, influencing consumer choices in e-fulfillment when buying online. The value of time is, applied to last mile delivery in e-fulfillment, the time and effort consumers are able or willing to spend to acquire the product.

Huang and Oppewal (2006) found perceived value of time to be a mediator between travel time to a store and travel time as a preference for home delivery. Time pressure is particularly relevant in this context.

Research by Scholte (2011) showed that home delivery is perceived as more convenient than in-store pick-up. In-store pick-up requires travelling to the store, and therefore requires time and effort. Value of time is expected to be higher for home delivery than in-store pick-up. Consumers therefore could differ in the perception of being busy, and therefore could differ in their preferences.

- H4E: There is difference between psychographic groups (including household attendance and VOT) on the stated preference of delivery speed.*
- H4F: There is difference between psychographic groups (including household attendance and VOT) on the stated preference of delivery location.*
- H4G: There is a difference between psychographic groups (including household attendance and VOT) in the effect of shipping fees on the preferences for the delivery location.*
- H4H: There is a difference between psychographic groups (including household attendance and VOT) in the effect of shipping fees on the preferences for the delivery speed.*

2.7 Research model

The research model in Figure 4 shows the different variables and their relationships with other variables.

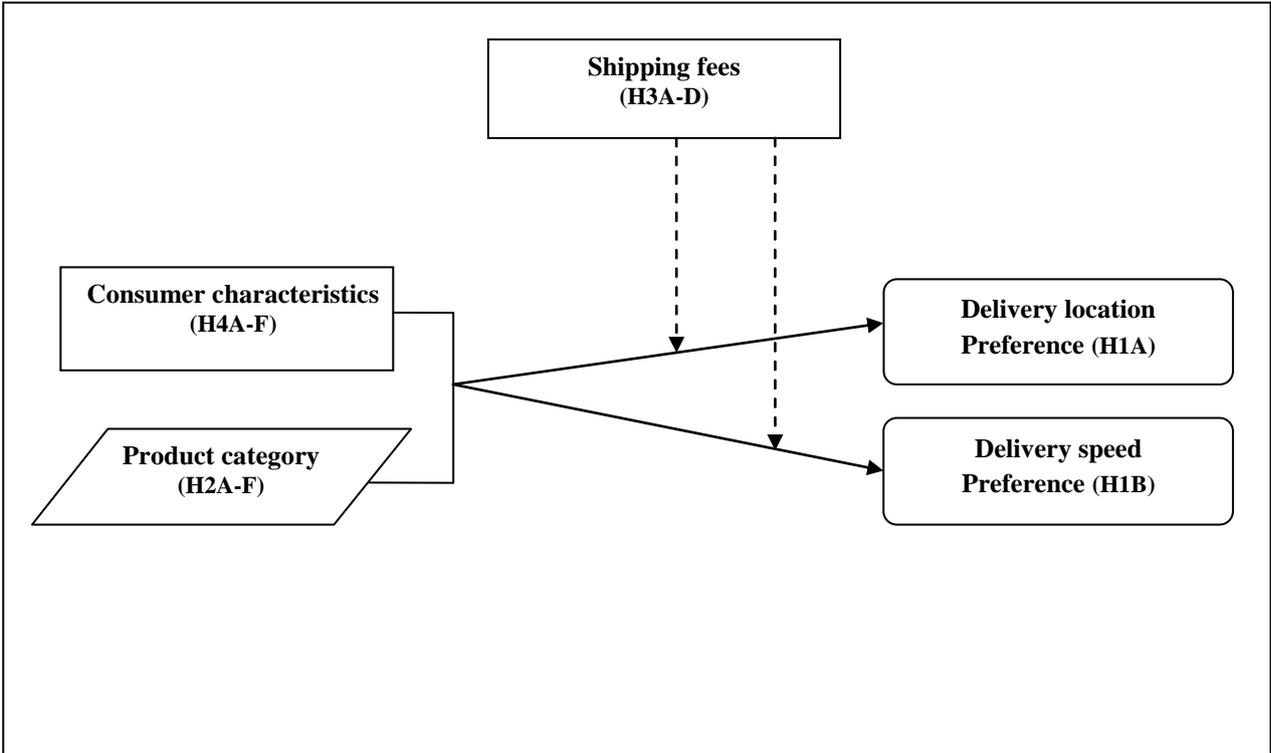


Figure 4: Research model

3 Methodology

This chapter provides an overview of the methodology. First, the tool for data collection is described, followed by a description of the respondents. Furthermore, the questionnaire and the main variables are discussed. This chapter concludes with an overview of how the hypotheses are tested.

3.1 Data collection

In order to test the hypotheses, a survey is used to collect the needed data. To gather data, two students interviewed respondents in the shopping centers of the urbanized areas of Utrecht and Rotterdam and in the regional cities in rural areas of Ede and Arnhem. Furthermore, the anonymity of the respondents is guaranteed (Sekaran, 2009).

3.2 Respondents

This study attempts to be representative for the consumer preferences of last mile delivery of the entire Dutch online shopping population. According to the national statistic institute in the year 2012 over 7.9 million people made an online purchase in 2012 (CBS, 2012). Because it is impossible to collect data from all these people, a target sample was set at a minimum of 300 respondents.

Because the survey is conducted only in shopping streets, there are some limitations to know. The respondents are all interviewed in shopping streets and therefore a part of the population is excluded. This could be consumers that do not have enough time to go shopping due to a busy work schedule (Goebel et al., 2012). Consumers in shopping streets might prefer to have the advice of personnel in stores or prefer to see, touch and try the product (Kollmann et al., 2012). This could be a reason for respondents to prefer pick-up in-store.

3.3 Questionnaire

To measure the effects of the independent variables on the dependent variables, we conducted a quantitative survey. To test the delivery preferences, several questions were developed to conduct a conjoint analyses model. The conjoint design and analysis will be explained in section 3.5.1. The survey was conducted on the streets of shopping centers in rural as well as urbanized areas, using interviews. The questionnaire served as a basis for two theses. Therefore, not all questions in the questionnaire are used in this particular thesis. For developing the survey, hypotheses were translated into questions. All variables were considered in the conceptual model.

3.4 Measurement of variables

To measure all variables, several scientific studies were used to develop the questions in the survey. Therefore, the reliability of this questionnaire is quite high (Berenson et al., 2005). Table 3 provides an overview of the used variables, corresponding to the questions in the questionnaire.

Table 3: Variable overview in questionnaire

Question	Variable	Type	Original scale	Survey scale	Reference
1	Online shopping experience	General <i>Ordinal</i>	-	<i>Ordinal</i>	(Twinklemagazine.nl, 2012b)
2	Reason for online shopping	General <i>Nominal</i>	5-point Likert	<i>Nominal</i>	(Xing et al., 2010)
3	Consumer characteristics (Psychographics)	Independent <i>Rating</i>	5-point Likert	5-point Likert	(Balasubramanian et al., 2005)
X	Product group	Mediating <i>Scenario</i>	X	X	X
4.1-4.2	Pick-up preference	Dependent <i>Ordinal</i>	-	5-point Likert	Self made
5.1-5.5	Delivery preference & willingness to Pay	Dependent <i>Ordinal</i>	3-point Likert	5-point Likert	(Goebel et al., 2012)
6.1-6.2	Shipping fees (Trade-off)	Independent <i>Ordinal</i>	-	5-point Likert	Self made
7-10	X	X	X	X	X
5b+11-13	Consumer characteristics (Demographics)	Independent <i>Nominal/open</i>	<i>Nominal and open</i>	<i>Nominal and open</i>	(Chang et al., 2005)

3.4.1 Consumer characteristics

Demographics

Respondents' age and education were asked with an open-ended question. For gender and income, respondents could choose between male/female and between three income groups, known as modal income, below and above modal income. Zip codes were asked to divide groups of urbanity, according to the Dutch National Statistics institute (CBS, 2012). The CBS (2012) defines urbanized areas as areas with more than 1500 households per square kilometer. The survey zip codes were compared to the ones in the urbanicity database of the CBS and recoded to 0 for rural areas and 1 for urbanized areas.

Psychographics

Respondents were asked two questions, one about their home attendance and one about their value of time by asking how busy consumers perceive themselves. Both questions were measured on a 5-point Likert scale.

3.4.2 Product groups

The survey consisted of three different scenarios of product groups. In line with Thirumalai and Sinha (2005), three products were used; a book, a jeans and a laptop. The difference between product groups can be measured by comparing results of identical situations. Conjoint analysis presents the amount of utility per product group and is therefore able to measure the differences between product groups. All cards are rated on a 5-point Likert scale.

3.4.3 Shipping fees

The variable shipping fees consists of two questions on the trade-off respondents make in a situation where the price of 24-hour delivery is considered to be too high. Respondents were asked to rate the opportunity for a lower delivery speed in combination with less shipping fees and to rate the opportunity to pick-up the product for free in a store. These two questions were measured on a 5-point Likert scale. Furthermore, the conjoint analysis is able to test main effects of different factors like speed, price, location and product group. We were therefore able to double check whether price affects choices consumers make on delivery speed and delivery location, and what trade-offs consumers make when shipping fees are perceived to be too high. Regarding delivery locations the following prices were used; € 0, € 4 and € 6. Regarding delivery speeds the following prices were used; € 0, € 4, € 6, € 10, € 14.

3.4.4 Delivery speed & delivery location preferences

Based on a conjoint analysis design, question 5 on *delivery speed* and *delivery location* is studied. The used prices of shipping fees in the conjoint analysis are deviated from a wide range of shipping fees that web shops in the Dutch market offer (DeliveryMatch, 2011). Respondents had to rate different situations with regard to delivery speed and delivery location, in combination with price and product groups. With an Ordinary Least Squared regression (OLS), the estimated total utility of all attributes and levels were measured and the main effects of consumer choices were analyzed. Moreover, the conjoint design is given in subsection 3.5.1. Regarding delivery speed, a 24-hour delivery and 2-5 days lead times were used. Regarding locations, home delivery and pick-up were used.

3.5 Hypotheses testing

This section describes the testing of the different hypotheses including the assumptions.

3.5.1 Hypotheses 1, 2, 3(A): Consumer preferences

For question 5, respondents had to rate different cards according to a conjoint analysis model. A conjoint analysis is used to investigate how consumers trade off product attributes when making a purchase decision (Kuhfeld, 2009). This test is used to test hypotheses 1 thru 4;

H1A: Consumers prefer home delivery over pick-up up of their package.

H1B: Consumers prefer 24-hour delivery speed over 2-5 days delivery speed.

H2A: There is a difference between product groups regarding the preference of delivery location.

H2B: There is a difference between product groups regarding the preference of delivery speed.

H3A: Shipping fees influence consumer preferences on delivery options for speed and location.

The conjoint design of this research is based on studies of (Goebel et al., 2012, Schaupp and Bélanger, 2005) and is a full-profile design. Full-profile designs let you estimate main effects and interactions (Kuhfeld, 2009). The full profile approach uses the complete set of factors for the subject to evaluate.

The full-profile approach presents a more realistic description of stimuli by defining the levels of each of the factors, thereby considering the potential environmental correlations between factors in real stimuli (Green and Srinivasan, 1978). Another advantage of the full-profile method is the ability to directly measure overall preference judgments. Finally, the full profile approach is likely to have more predictive validity (Schaupp and Bélanger, 2005).

In a full-profile design, all main effects, all two-way interactions, and all higher-order interactions are estimable. Full-profile designs are both orthogonal and balanced, and therefore of particular interest. In this study, two separate full-factorial designs are developed, to enable studying the preference of delivery speed and pick-up location, both containing the factors and attributes as shown in Table 4.

Table 4: Orthogonal design of the conjoint analysis

<i>Attribute</i>	<i>Level</i>	<i>Attribute</i>	<i>Level</i>
Product type:	- Book - Jeans - Laptop	Product type:	- Book - Jeans - Laptop
Delivery speed:	- 24 Hour - 2-5 Days	Delivery option:	- Pick-up - Home delivery
Price:	- Free - € 4 - € 6 - € 10 - € 14	Price:	- Free - € 4 - € 6

A conjoint analysis comes with a couple of assumptions; one should include enough conjoint questions or cards to sufficiently reduce measurement error. SPSS Conjoint Analysis manual suggests asking enough questions to obtain three times the number of observations as parameters to be estimated, or a number equal to $3(K - k + 1)$, where K is the total number of levels across all attributes and k is the number of attributes. This number is met in both models.

In traditional full-profile the minimum sample size is one. However, the traditional conjoint methodology does not include a self-explicated priors section, its utilities tend to have greater variability (Karniouchina et al., 2009).

To test the validity of the model, Pearson’s R and Kendall’s tau both give a significant result on the correlation. The sample size of conjoint differs largely between studies, from $N=35$ (Schaupp and Bélanger, 2005) to $N=186$ (Goebel et al., 2012).

Because the dependent variables in the conjoint analysis are the preference scores of the respondents, conjoint analysis will estimate these scores by means of an OLS regression. This model can be written as:

$$U(X) = \sum_{i=1}^m \sum_{j=1}^{k_i} a_{ij} \cdot x_{ij}$$

Where $U(X)$ = overall utility of an alternative

a_{ij} = the part-worth contribution or utility associated with the j th level

($j=1,2,\dots,k_j$) of the i th attribute ($i,i=1,2,\dots,m$)

K_i = number of levels of attribute i

m = number of attributes

x_{ij} = 1 if the j th level of the i th attribute is present

= 0 if otherwise

3.5.2 Hypotheses 3 (B-D): Shipping fees

This subsection describes the analysis of hypotheses 3B, 3C and 3D:

H3B: Shipping fees are positively related to consumer preferences for lower delivery speed.

H3C: Shipping fees are positively related to consumer preferences for pick-up locations.

To test the effect of shipping fees on the trade-off respondents make when shipping fees are perceived to be too high, a Wilcoxon Signed Rank Test will be performed to check the effects on choices for a lower delivery speed and the choice for pick-up locations. According to Sekaran (2009), the Wilcoxon Signed Rank Test is designed to use with repeated measures, i.e., when respondents are measured on two occasions, or under two different conditions. It is the non-parametric alternative to the repeated measures t-test, but instead of comparing means, the Wilcoxon converts scores or ranks and compares these scores to see if there is a significant difference.

Although non-parametric techniques have less stringent assumptions, there are some general assumptions that should be checked (Daniel, 1990). The sample needs to be random and observations need to be independent. This means that each person or case counts only once, they cannot appear in more than one group, and the data from the one subject cannot affect the data from another subject. The exception to this, is the repeated measures techniques, including the Wilcoxon Signed Rank Test where the participants are retested on different occasions or under different conditions.

The results of the Wilcoxon Signed Rank Test show a Z-value and a significance level. If the significance value is equal or less than .05, the difference between the two scores is statistically significant.

SPSS does not provide an effect size, but the value of Z can be used to calculate an approximate value of 'r.' (Cohen, 1988). The r. value indicates the size of the effect. According to Cohen (1988), an r. value of 0.1 is a small effect, a value of 0.3 is a medium effect and a value of 0.5 is a large effect.

3.5.3 Hypotheses 4(A-H): Consumer characteristics

This subsection gives an overview of the testing method of the hypotheses 4A thru 4H.

H4A: There is difference between demographic groups (including income, age, education and living place) on the stated preference of delivery speed.

H4B: There is a difference between demographic groups (including income, age, education and living place) on the stated preference of delivery location.

H4C: There is a difference between demographic groups (including income, age, education and living place) in the effect of shipping fees on the preferences for the delivery location.

H4D: There is a difference between demographic groups (including income, age, education and living place) in the effect of shipping fees on the preferences for the delivery speed.

H4E: There is difference between psychographic groups (including household attendance and VOT) on the stated preference of delivery speed.

H4F: There is difference between psychographic groups (including household attendance and VOT)on the stated preference of delivery location.

H4G: There is a difference between psychographic groups (including household attendance and VOT) in the effect of shipping fees on the preferences for the delivery location.

H4H: There is a difference between psychographic groups (including household attendance and VOT) in the effect of shipping fees on the preferences for the delivery speed.

To test the difference between demographic and psychographic groups on their preferences on delivery speed, delivery location and the effect of shipping fees, the Kruskal-Wallis Test will be used. The Kruskal-Wallis Test is the non-parametric alternative to a one-way-between-groups analysis of variance. It allows you to compare the scores for three or more groups.

No further assumptions are made. The data is sampled randomly and has independent observations.

The main pieces of output are the Chi-square value, the degrees of freedom (df.) and the significance level. In the event of finding a significant result, one needs to perform a Mann-Whitney U post-hoc analysis to find out which groups differ from each other.

The Mann-Whitney U Test is used to test for differences between two independent groups (Pallant, 2010). This test is the non-parametric alternative for the t-test for independent samples.

Instead of comparing means of the two groups, as in the case of the T-test, the Mann-Whitney U Test actually compares medians. It converts the scores to ranks for two groups and then evaluates whether the ranks for the two groups differ significantly.

The main values of the Mann-Whitney U Test are the Z-value and the significance level. If the sample size is larger than 30, which is the case in this test, SPSS will provide a Z-value, which includes a correction for ties in the data. There is a significant result when the significance level is less or equal to .05. In order to describe the direction of the difference, the mean rank shows which group shows a higher value. In order to give qualitatively better results, one can use the median values for each group (Daniel, 1990).

To measure the effect size like in the Wilcoxon Signed Rank Test, one needs to calculate the r. value of Cohen (1988).

4 Empirical results

This chapter presents an overview of the analyses that were conducted.

4.1 Descriptive statistics

4.1.1 Sample characteristics

In order to gather all the respondents, interviews were conducted for a period of two weeks. Mostly, these interviews took place on shopping nights and on weekends. This has led to a total of 300 respondents. An overview is given in Table 5.

Table 5: Sample characteristics

Variables	Groups	Frequencies	Percentage
Gender	Male	145	48.3%
	Female	155	52.7%
Age	Open	32 (average)	
Living area	Urbanized area	183	61.0%
	Rural area	117	39.0%
Education	Lower education	9	3.0%
	MAVO	18	6.0%
	HAVO	19	6.3%
	VWO	10	3.3%
	MBO	74	24.7%
	HBO	107	35.7%
	WO	63	21.0%
Income	Below modal	140	46.7%
	Modal	93	31.0%
	Above modal	50	16.7%
Buying frequency	Once per week	20	16.7%
	Once per month	118	39.3%
	1-4 Times a year	162	54.0%
Buying reasons	Convenience	157	52.3%
	Price sensitive	60	20.0%
	Product availability	82	27.3%
	Different	1	0.03%
Product group	Convenience goods	98	32.7%
	Shopping goods	100	33.3%
	Specialty goods	102	34.0%

A total of 300 respondents participated in this study (145 males, 155 females). Most participants finished an HBO educational level. Mean age of the participants is 32 years. According to the general statistics of the Dutch National Institute for Statistics (CBS), our sample contains twice as much participants with an HBO educational level than the general population. The percentage of lower educated and HAVO/VWO respondents in this research is less than the population of the CBS.

This means that based on education level, this sample differs from the statistics of the CBS. In addition, our sample includes younger respondents than the shopping population of the CBS.

The level of income mainly varies around lower than modal and a modal income, which is similar to figures of the CBS (see appendix B).

Furthermore, the majority of the respondents (54%) shop 1 to 4 times a year online and mainly out of convenience (52.3%) Finally due to randomization in the questionnaire design, one third of the respondents are presented to convenience goods (32.7%), one third to shopping goods (33.3%) and one third to specialty goods (34.0%).

4.2 Hypotheses testing

In this section, the hypotheses are tested.

4.2.1 Hypothesis 1, 2, 3(A)

To test hypotheses 1A, 1B, 2A, 2B and 3A a conjoint analysis was performed. Because two orthogonal designs were created to study the preferences on delivery speed and location, two models will be used. Model A tests delivery speed, and model B tests delivery location.

Table 6 shows two statistics, Pearson's R and Kendall's tau on both models A and B. Pearson's R and Kendall's tau provide measures of the correlation between the observed and the estimated preferences. The conjoint procedure computes these correlations to check the validity of the utilities. The table shows that Pearson's R and Kendall's tau are both significant, which indicates that the correlations between the observed and predicted ratings are valid in both studies.

Table 6: Correlations between observed and estimated preferences

<i>A: Delivery speed</i>	Value	Sig.	<i>B: Delivery location</i>	Value	Sig.
Pearson's R	.959	.000	Pearson's R	.816	.000
Kendall's tau	.836	.000	Kendall's tau	.713	.000

By means of part-worth utilities, a conjoint analysis determines which combinations of the levels of attributes are most preferred for each respondent.

Table 7 shows the part-worth scores and their standard errors for each level of the attribute. Higher utility scores indicate greater preference. As hypothesized, delivery within 24 hours is preferred over delivery in 2-5 days. Furthermore, home delivery is preferred over picking up the goods. The higher the utility score, the higher is the preference compared to the other levels of the same attribute. A negative score means that the level is less preferred compared to the other levels of the same attribute.

It is important to remember that the conjoint scores are aggregated scores. The utility scores were calculated for each respondent individually and then aggregated to produce the scores as presented in Table 7.

Table 7: Utilities Delivery speed and Delivery location

Model A: Delivery speed		Utility Estimate	Std. Error	Model B: Delivery location		Utility Estimate	Std. Error
Delivery speed	24-hour	.262	.070	Delivery location	Pick-up	-.202	.173
	2-5 days	-.262	.070		Home delivery	.202	.173
Shipping fee	Free	1.753	.140	Shipping fee	Free	1.093	.245
	€ 4	.0533	.140		€ 4	-.258	.245
	€ 6	-.368	.140		€ 6	-.835	.245
	€ 10	-.830	.140				
	€ 14	-1.088	.140				
Product group	Convenience	-.362	.099	Product group	Convenience	-.204	.245
	Shopping	-.026	.099		Shopping	.147	.245
	Specialty	.388	.099		Specialty	.058	.245
	(Constant)	2.762	.070		(Constant)	2.675	.173

H1A is ACCEPTED, consumers prefer home delivery over pick-up up of their package.

H1B is ACCEPTED, consumers prefer 24-hour delivery speed over 2-5 days delivery speed.

The results in both models indicate differences between product groups. This can be explained by the higher preference scores for specialty goods than for convenience goods among all possible combinations of attributes and levels. This indicates that there is a difference in consumer preferences between groups with regard to delivery speed and delivery location.

Model B (on delivery location) shows higher standard errors than utility scores in the product groups. Therefore an additional Kruskal-Wallis test was conducted to check whether the differences between product groups are significant (for assumptions and explanations, see section 3.5).

This test did not show any significant differences between the three product groups (see Table 8).

Table 8: Kruskal-Wallis Test statistics between product groups

	Delivery location preference
Chi-square	.890
Df.	2
Sig.	.641

Grouping variable: Product groups

H2A is REJECTED; there is NO difference between product groups regarding the preference of delivery location.

H2B is ACCEPTED, there is a difference between product groups regarding the preference of delivery speed.

Furthermore, Table 7 shows a difference in utility between shipping fees. Free shipping gives a high utility, whereas higher shipping fees show lower utilities. In order to test the most important attribute (either speed, shipping fee or product group), a conjoint analysis generated the relative importance of each attribute on consumer preference. The values are computed by dividing the utility range of the considered attribute by the sum of the utility ranges of all attributes and are conducted separately for each subject. Next, these figures were averaged over all subjects. The values thus represent percentages. For model A and B, the most important attribute is the shipping fee with respectively 67.168 % and 60.501%. For the important values of product group, delivery speed and delivery options, see appendix D.

H3A is ACCEPTED, shipping fees influence consumer preferences on delivery options for speed and location.

Additional analyses were conducted to test whether respondents were willing to pay higher delivery fees for faster delivery. The Wilcoxon Signed Rank Test was used (see section 3.5 for assumptions and explanation). The Wilcoxon Signed Rank Test showed a significant result, meaning that consumers are willing to pay up to € 2 more for faster delivery. No significant results were found for a € 4, € 6 and €10 price difference. A € 14 price difference shows a significant result and indicates a turning point where no respondent chooses for a higher delivery speed. Table 9 shows the percentage of consumers for each significant delivery speed option (Wilcoxon output can be found in appendix F).

Table 9: Consumer choices based on difference in shipping fees

<i>Difference in shipping fees</i>	<i>24-Hour delivery</i>	<i>2-5 Days lead-time</i>
<i>€ 0 **</i>	<i>91.46%</i>	<i>8.54%</i>
<i>€ 2 **</i>	<i>76.34%</i>	<i>23.66%</i>
<i>€ 4 n.s.</i>	<i>58.62 %</i>	<i>41.38%</i>
<i>€ 6 n.s.</i>	<i>43.64%</i>	<i>56.36%</i>
<i>€ 10 n.s.</i>	<i>36.11%</i>	<i>63.89%</i>
<i>€ 14**</i>	<i>0 %</i>	<i>100%</i>

**** = Significant at 0.01 * = Significant at 0.05**
n.s. = Not significant

4.2.2 Hypotheses 3B, 3C

To test hypotheses 3B and 3C, a Wilcoxon Signed Rank Test was conducted to test the influence of shipping fees on the trade-off for a lower delivery speed and to test the influence of shipping fees on the trade-off for pick-up locations. See section 3.5 for assumptions and explanation.

Table 10 shows a statistically significant trade-off from the preferences of 24-hour delivery speed to the alternative of 2-5 days delivery speed, $Z=-5.881$, $P<.001$, with a medium to large effect size ($r=.351$). Also, a statistically significant effect is found on the trade-off from 24-hour delivery speed to the pick-up of goods having a medium effect size ($r=.316$), $Z=-5.517$, $P<.001$. Consumers in general rate in-store pick-up to be convenient at (59%) and pick-up at a central service point to be convenient (70%).

Table 10: Wilcoxon Signed Rank Test on 2-5 days deliver speed and pick up trade-offs

	2-5 Day delivery	Pick-up
Z	-5.881	-5.517
Asymp. Sig. (2-tailed)	.000	.000
r. (Cohen, 1988)	.351	.316

An additional Kruskal-Wallis to test differences between product groups showed a statistical significant difference for a 2-5 days delivery speed (sig .000), but not for pick-up of goods (sig .377). The difference between convenience goods and shopping goods was $Z=-5.348$ (sig .000); consumers thus prefer fast delivery for shopping goods ($M_r = 62.82$), but not per se for convenience goods ($M_r = 34.18$). The difference found between convenience goods ($M_r = 61.13$) and specialty goods ($M_r = 45,11$) was also significant: $Z=-2.847$, and sig .004, thus a 2-5 day delivery fits best with convenience goods and less with shopping and specialty goods. Between the latter pair, no significant differences were found. Output results can be found in appendix E.

H3B is ACCEPTED, shipping fees are positively related to consumer preferences for lower delivery speed.

H3C is ACCEPTED, shipping fees are positively related to consumer preferences for pick-up locations.

An additional analysis was conducted to test whether respondents were willing to pay higher delivery fees for home delivery than for pick-up. The Wilcoxon Signed Rank Test showed significant results for € 0, € 2, and € 4 euro price difference between the two delivery locations. This means that up to a € 4 price difference, consumers still prefer home delivery over pick-up.

Above € 4 no significant results were found. Additionally Table 11 shows the percentage of consumers that choose between two delivery speed options with a significant result. Wilcoxon output can be found in appendix F.

Table 11: Consumer choices based on difference in shipping fees

<i>Difference in shipping fees</i>	<i>Home delivery</i>	<i>Pick-up</i>
€ 0 **	98.32%	2.68%
€ 2 **	81.78%	18.22%
€ 4 **	63.12%	36.88%
€ 6 <i>n.s.</i>	57.37%	42.63%

** = *Significant at 0.01*

* = *Significant at 0.05*

n.s. = *Not significant*

4.2.3 Hypotheses 4(A-H)

To analyze how consumer preferences and trade-offs differ between consumer segments, a Kruskal-Wallis test was conducted. When significant results were found, an additional Mann-Whitney U post-hoc test was conducted to check where the significant effects were found. See section 3.5 for assumptions and explanation.

Education and living place only consisted of 2 groups, and could directly be tested with a Mann-Whitney U test. Table 12 shows an overview of the results.

The Kruskal-Wallis test between the *Age* groups showed a significant difference on the trade-off for *lower delivery speed* (.016). Mann-Whitney U test showed statistical significant effects between the age groups *lower than 25 years old* and *25-44 years old* (.008), and between *elderly from 44 years old and higher* and the group of respondents with an age *lower than 25 years old* (.007). This means that respondents younger than 25 years old prefer lower delivery speed when shipping fees are higher.

The Kruskal-Wallis test on *income* showed a significant difference *on pick-up due shipping fees* (.001) and *a lower delivery speed due shipping fees* (.000). Mann-Whitney U showed significant effects between the income classes of *lower than modal* and *modal* on pick up due shipping fees (.005) and lower delivery speed (.000).

Between *lower than modal* and *higher than modal incomes*, a significant result was found on *pick-up due shipping fees* (.000) and *lower delivery speed due shipping fees* (.001)

The Mann-Whitney U test on *living place* showed a significant difference on *pick-up due shipping fees* (.000). Respondents in *urban* areas have a higher mean rank (85.41) than respondents in *rural* areas (59.37).

Within the different education levels, no significant results were found. Value of time and household attendance also didn't show any significant effects.

Table 12 shows an overview of all Kruskal-Wallis and Mann-Whitney U test results (see appendix G for an extended overview of the output results).

Table 12: Kruskal-Wallis & Mann-Whitney U Test results

<i>Consumer characteristics</i>	<i>Delivery speed</i>			<i>Delivery location</i>			<i>Pick up due shipping fees</i>			<i>2-5 Days delivery due shipping fees</i>		
	<i>Z</i>	<i>R</i>	<i>Sig.</i>	<i>Z</i>	<i>R</i>	<i>Sig.</i>	<i>Z</i>	<i>R</i>	<i>Sig.</i>	<i>Z</i>	<i>R</i>	<i>Sig.</i>
Age < 25 vs. (25-44) (25-44 vs. >44 > 44 vs. <25	-1.147	.012	.883	-.508	.041	.611	-1.256	.103	.209	-2.642	.216	.008**
	-.143	.012	.886	-1.092	.089	.275	-.756	.062	.450	-.326	.027	.744
	-.261	.021	.794	-1.188	.097	.235	-2.695	.220	.097	-.2695	.220	.007**
Income < Modal vs. Modal Modal vs. >Modal < Modal vs. >Modal	-.668	.055	.504	-1.478	.121	.139	-2.828	.231	.005**	-4.033	.329	.000**
	-1.346	.109	.178	-.262	.021	.793	-1.883	.154	.060	-1.455	.119	.146
	-1.856	.152	.063	-1.254	.102	.210	-3.997	.326	.000**	-3.292	.269	.001**
	<i>Z</i>	<i>R</i>	<i>Sig.</i>	<i>Z</i>	<i>R</i>	<i>Sig.</i>	<i>Z</i>	<i>R</i>	<i>Sig.</i>	<i>Z</i>	<i>R</i>	<i>Sig.</i>
Living place <i>Rural vs. Urban</i>	-354	.029	.723	-1.728	0.14	.084	-3.639	.295	.000**	-.297	.024	.766
Education <i>Lower education vs. Higher education</i>	-.331	.027	.740	-.784	.064	.433	-662	.054	.508	-.754	.064	.451
Household attendance <i>High vs. Low</i>	-1.210	.098	.226	-.1.777	.145	.076	-.490	.040	.690	-.889	.073	.374
Value of time <i>Hihg vs. Low</i>	-.205	.068	.838	-1.891	.154	.059	-.326	.027	.745	-1.047	.096	.295

** = Significant at 0.01

* = Significant at 0.05

H4A is REJECTED; there is NO difference between demographic groups (including income, age, education and living place) on the stated preference of delivery speed.

H4B is REJECTED; there is NO difference between demographic groups (including income, age, education and living place) on the stated preference of delivery location.

H4C is PARTLY ACCEPTED; there is a difference between demographic groups (including income, age, education and living place) in the effect of shipping fees on the preferences for the delivery location.

H4D is PARTLY ACCEPTED; there is a difference between demographic groups (including income, age, education and living place) in the effect of shipping fees on the preferences for the delivery speed.

H4E is REJECTED; there is NO difference between psychographics groups (including household attendance and value of time) on the stated preference of delivery speed.

H4F is REJECTED, there is NO difference between psychographics groups (including household attendance and value of time) on the stated preference of delivery location.

H4G is REJECTED, there is NO difference between psychographic groups (including household attendance and VOT) in the effect of shipping fees on the preferences for the delivery location.

H4H is REJECTED, there is NO difference between psychographic groups (including household attendance and VOT) in the effect of shipping fees on the preferences for the delivery speed.

4.2.4 Overview hypotheses

The latter sections showed the results on the hypotheses. Table 13 presents a clear overview of all the accepted and (partly) rejected hypotheses.

Table 13: Overview hypotheses

Hypotheses	Acceptance
1A: Consumers prefer home delivery over pick-up up of their package	ACCEPTED**
1B: Consumers prefer 24-hour delivery speed over 2-5 days delivery speed	ACCEPTED**
2A: There is a difference between product groups regarding the preference of delivery location	REJECTED
2B: There is a difference between product groups regarding the preference of delivery speed	ACCEPTED**
3A: Shipping fees influence consumer preferences on delivery options for speed and location.	ACCEPTED**
3B: Shipping fees are positively related to consumer preferences for lower delivery speed.	ACCEPTED**
3C: Shipping fees are positively related to consumer preferences for pick-up locations.	ACCEPTED**
4A: There is difference between demographic groups (including income, age, education and living place) on the stated preference of delivery speed	REJECTED
4B : There is difference between demographic groups (including income, age, education and living place) on the stated preference of delivery location	REJECTED
4C: There is a difference between demographic groups (including income, age, education and living place) in the effect of shipping fees on the preferences for the delivery location.	PARTLY
4C1: <i>Income</i>	ACCEPTED*
4C2: <i>Age</i>	ACCEPTED**
4C3: <i>Education</i>	REJECTED
4C4: <i>Living place</i>	ACCEPTED**
4D: There is a difference between demographic groups (including income, age, education and living place) in the effect of shipping fees on the preferences for the delivery speed.	PARTLY
4D1: <i>Income</i>	ACCEPTED*
4D2: <i>Age</i>	ACCEPTED**
4D3: <i>Education</i>	REJECTED
4D4: <i>Living place</i>	REJECTED
4E: There is difference between psychographics groups (including household attendance and value of time) on the stated preference of delivery speed.	REJECTED
4F: There is difference between psychographics groups (including household attendance and value of time)on the stated preference of delivery location.	REJECTED
4G: There is difference in the influence of shipping fees on the preferences for the delivery location, between psychographics groups (including household attendance and value of time).	REJECTED
4H: There is difference in the influence of shipping fees on the preferences for the delivery speed between psychographics groups (including household attendance and value of time).	REJECTED

**** = Significant at 0.01**

*** = Significant at 0.05**

4.3 Discussion of results and implications

After reporting the accepted and rejected hypotheses in the previous section, this section will discuss the results and present theoretical and managerial implications based on our study.

It has become clear that consumer preferences have a big impact on the logistics of e-tailers and all the indirect effects that come along with these preferences, such as increasing pollution, congestion and operational peaks. Our main result was that a price difference in shipping fees could lead to different consumer preferences.

4.3.1. Consumer preferences

This research showed an overall preference of home-delivery within 24 hours. This can be explained by the fact that consumers choose for the service that is most practical and brings the biggest utility. Picking-up the goods yourself is therefore less preferred than home-delivery, because it takes more time and effort to handle the last mile yourself. The results of delivery speed preferences are in line with the existing literature on consumer preferences in the Dutch market. DeliveryMatch (2011) found a consumer preference for delivery within 24 hours and showed that consumers rate 24-hour delivery as either important or very important for different product groups.

The results on delivery speed preferences show differences between product groups. In an equal price situation, consumers prefer delivery within 24 hour for specialty goods even more than for convenience and shopping goods.

Because delivery speed preferences for specialty goods are rated significantly higher than for convenience goods and shopping goods, this indicates that consumers are less willing to pay for the same service on convenience goods (books) and shopping goods (jeans), than for specialty goods (laptops).

We didn't find any significant differences between products groups on delivery location. This is in contrast with the literature of Newton (2001), he states that consumers find it less important that for example commodities like books, that are locally available, are home-delivered. However, because that study was conducted in 2001, it is questionable whether that study is still relevant. The last decade, the supply chain has changed from a push to a pull supply chain: consumers have a more demanding role.

Research on the preferences for delivery speed and location showed no significant differences between consumer segments.

This can be explained by the fact that home delivery and higher delivery speed is perceived to be more important now and is therefore preferred for all consumer segments in an equal cost situation.

Field et al. (2004) found that variables like speed of delivery and accuracy of delivery, have a significant positive association with consumer loyalty and these factors could therefore increase sales. In line with Field et al. (2004) we found that it is indeed important for web shops to offer delivery within 24 hours. There are however several downsides with regard to the logistics handling within e-fulfillment. Two of these major downsides are operational peaks and increased transport movements.

Operational peaks occur mostly on Mondays, because relatively a lot is ordered during the weekend in combination with web shops offering 24-hour delivery. This obligates the web shops to process all the weekend orders to deliver the next business day. Furthermore, these goods need to be delivered, which increases transport movements. Factors increasing this problem are failure of delivery due to unattended homes and due to return of goods.

As a result of these factors, web shops are less flexible and might not be able to deliver on time. This could therefore lead to an increase of unsatisfied consumers and a loss of sales. Furthermore, higher peaks will increase costs because of extra employees needed that are necessary to process the orders.

Based on our results we might conclude that web shops might face problems on increasing operational peaks and transport movements.

4.3.2 The influence of shipping fees

The results in this research show that consumers consider shipping fees as most important factor when judging and rating a specific delivery option. This finding is supported by a study of Smith and Brynjolfsson (2010), who analyzed online price dispersion. They found that consumers are very sensitive when it comes to shipping fees and shipping times. This is one of the reasons that pricing strategies are a useful tool for web shops in e-fulfillment to manage demand.

Consequently, we studied the role of shipping fees. We looked at how consumers rate alternative delivery options when the overall preferred 24-hour delivery service is perceived to be too expensive. Results showed that consumers are willing to make a trade-off with regard to a lower delivery speed and to pick-up the orders themselves.

Furthermore, we found differences between convenience goods and specialty/shopping goods. Specialty goods were preferred to be delivered at home within 24 hours. Additional analysis which included shipping fees, showed a significant difference between product groups on the choice for a lower delivery speed.

A lower delivery speed is more preferred for convenience goods than for shopping and specialty goods. No effects for product groups were found with regard to picking up the goods yourself.

Similar results were found by Agatz (2009). His research showed an incentive for choosing ‘time-slots’. Although our study did not focus on time-slots, similar results were found with regard to choosing between different delivery speed options and delivery location options. Therefore, the findings of this study attribute to the existing literature on demand management in e-fulfillment.

Shipping fees showed to have a significant effect on the trade-offs for picking up the order and a lower delivery speed. However, differences between different consumer segments were found. Older consumers and consumers with higher incomes appeared to be less sensitive for shipping fees than younger respondents and lower income groups. These results are similar to findings of Jones et al. (1994) and Chang et al. (2009), who found that low-income shoppers are more price-sensitive than high-income shoppers. Because our sample was comparable to the sample population of CBS, this study presents useful insights for web shops and could increase the effect of demand management.

Education did not have any effect. This is rather remarkable, because highly educated consumers normally have higher incomes and are therefore less price-sensitive. This could be due to the fact that the current sample includes higher educated respondents that are mostly younger and therefore might be in the beginning of their careers.

Furthermore, consumers in rural areas were less willing to pick up their orders than consumers in urbanized areas. To make consumers willing to pick-up the product in a store or a central pick-up location, the stores need to be in the living area of the consumers. Weltevreden (2008) mentioned that the critical intersection point, whether a consumer is willing to pick-up his order or not, is around 5 minutes driving by car.

We didn’t find any effects with regard to value of time and household attendance.

The findings on consumer segments and product groups form an incentive for web shops to apply price differentiation by shipping fees. Differences in pricing are fairly intuitive and are commonly practiced by many businesses including hotels (weekends vs. weekdays) and package delivery services (Monday-Friday vs. Saturday delivery).

Because web shops can change prices easily, this is an incentive for dynamic pricing; they could use this to manage demand real-time and could therefore respond to sudden demand changes. There is a catch: sudden price changes are commonly regarded as unfair and can lead to frustration with the consumer (Ernst & Young, 2011). This will further be explained in section 5.3.

Managing demand by shipping fees presents several incentives to deal with the logistical impacts of 24-hour delivery preference. High delivery speed causes operational peaks and cut-off times can cause sudden demand changes. By using shipping fees as a pricing strategy, web shops are able to manage consumer behavior and choices and therefore demand for a certain delivery option. Two implications are presented.

First, higher shipping fees will lead to the choice for a lower delivery speed. This gives web shops more flexibility in their operations. As a result of longer lead-times, web shops are able to smoothen peaks and stock-levels are likely to drop (Simchi-Levi et al., 1999). Furthermore, flexibility in lead-times can help increase e-fulfillment efficiency (Agatz, 2009). Therefore, web shops should consider applying shipping fees as a pricing strategy.

Second, a significant effect of shipping fees is the trade-off for 24-hour delivery to the pick-up of the goods. Results show significant effects shipping fees on consumer choices for pick-up as compared to home-delivery. From a supply chain perspective this causes one of the biggest changes in the distribution network. Delivering to a store or a pick-up point gives an incentive to use the existing distribution network and to consolidate orders, which decreases transport movements. This, in turn, is a big advantage regarding the trends on increasing Internet sales and increasing fuel prices. Furthermore, the use of the existing network will be more cost-efficient.

Other logistic benefits for picking up the goods are the ease of returning goods preventing delivery when nobody is at home.

Furthermore, urban consumers are more willing to pick up their orders than consumers in rural areas. This is a positive finding, considering the trend that 70% of the world population will live in cities by the year of 2020 (Capgemini, 2011). Picking up the goods could also lead to additional in-store sales.

In sum, there is an incentive for Dutch multi-channel e-tailers to use shipping fees to manage demand. Until now, hardly any literature on consumer behavior and the trade-offs consumers was available. This study therefore extends literature on demand management, e-fulfillment and consumer behavior, and provides insights and incentives for the Dutch multi-channel e-tailers.

5 Conclusion

This chapter includes a concise summary of all results and describes the limitations and possible areas for further research.

For the summary, the sub-questions serve as a guide structuring the text.

5.1 Summary

The first sub-question was *'According to the literature, what are delivery and pricing options in e-fulfillment with respect to different delivery speeds and delivery locations?'* A literature review was performed to present a representative overview of the different delivery options in e-fulfillment. We considered two main delivery characteristics: *delivery location* and *delivery speed*. For delivery locations, consumers can pick-up their orders in-store or at a central pick-up point and thus handle the last mile themselves or they can be delivered at home. Common central pick-up points are gas stations, postal offices, and bookshops. Home delivery can be divided into attended and unattended home delivery. *Home delivery* can be divided into attended and unattended home delivery. Relatively new in attended home delivery is time-slot delivery, where products are delivered in a specific time-slot. For the Dutch market, the most common delivery speed is a 24-hour delivery for orders placed before 10:00 PM. Few web shops even offer same day delivery. The average price for home delivery is € 4,95 and picking up the goods mostly free. Picking-up orders at a central pick-up point generally costs € 2,50. The main advantage of home delivery is the perceived convenience, whereas the advantage for pick-up is that no shipping fees are charged.

The second sub-question was *'According to the literature, what is the impact of delivery options on logistics handling in e-fulfillment with respect to speed and location?'* A literature review on delivery options and logistics handling in e-fulfillment showed that delivery within 24 hours home-delivery have the biggest impact on logistics handling in e-fulfillment. The effect of delivery within 24 hours on the logistical handling can be divided into *high operational peaks* in warehouses, mostly on Mondays and *increasing transport movements* because of the delivery of individual orders, instead of the opportunity to create economies of scale. As a result, web shops need more personal to pick and deliver the orders on-time. Because web shops need to deliver every single order, transport movements increase and congestion and higher fuel costs are common. In times of increased consumer awareness on sustainability this is not a positive development.

The third sub-question was *'Which preferences for delivery options do consumers have and how do they differ between consumer segments and product groups?'* Using existing literature, a list of hypotheses was created on consumer preferences for delivery options and how they differ between product groups and consumer segments. In order to test the hypotheses a survey was conducted.

Results showed a strong preference for *home delivery* instead of *picking-up* the order. No differences were found among *consumer segments* and *product groups* for these preferences. With regard to the preference on *delivery speed*, consumers show a strong preference for 24-hour delivery instead of a longer lead-time.

The preference for *delivery speed* differs between *product groups*, however. Empirical results showed a difference between *convenience goods* and *specialty goods*. Faster delivery is preferred for *specialty goods* (i.e. laptop), but not per se for *convenience goods* (i.e. book) or *shopping goods* (i.e. jeans).

The fourth sub-question was: '*How do shipping fees influence consumer preferences for delivery options and how does this vary between product groups and consumer segments?*' The results in this research showed that consumers consider *shipping fees* as the most important factor when judging and rating delivery options. With regard to the effect of price on the preferences for *24-hour home delivery*, we see two things: first, we found a significant effect of *shipping fees* on the trade-off consumers make for choosing a *lower delivery speed* i.e., delivery in *2-5 days*. Second, we found a significant effect of *shipping fees* on the trade-off consumers make in choosing to *pick-up* the goods. Furthermore, the results showed differences between the different product groups for the preference of a *lower delivery speed*.

Convenience goods were preferred to be delivered with a *lower delivery speed*. *Shopping goods* and *specialty goods* both significantly differed from *convenience goods*, meaning that for those product groups this alternative delivery option of a *lower delivery speed* was less preferred. No differences were found for *picking-up* the goods.

On consumer characteristics *age* and *income*, a significant result was found on the preference for a *lower delivery speed*. Younger consumers and a lower income consumers show to be more willing to be delivered with a lower delivery speed. *Education level* and *living place* did not show any significant differences. In addition, no significant differences were found for *pick-up* locations. Furthermore, consumers in *urban areas* were more willing to pick-up their orders than consumers in *urban areas*.

The main research question of this thesis is:

"How do shipping fees influence consumer behavior in various consumer segments on the choice of delivery in e-fulfillment between different product groups?"

The discussion of the sub-questions showed that shipping fees play an important role in consumer choices between delivery options. Shipping fees have a significant effect on consumer preference. This shows that consumer behavior can be affected by shipping fees. We found proof that higher shipping fees cause for consumers to make trade-offs to a lower delivery speed and even a pick-up of orders instead of home-delivery.

Although significant results were found on consumer trade-offs, the effect of shipping fees differ between consumer segments. Age and income both differed on either pick-up and a lower delivery speed. This shows that higher incomes are less price-sensitive. Living place only showed to have an effect on picking-up. This shows that consumers in rural areas are less willing to pick up their orders. For the education, value of time and home attendance, no significant effects were found.

With regard to differences between product groups, no significant results were found on the trade-off to pick-up orders. With regard to delivery speed, we found differences between convenience goods and shopping goods and between convenience goods and specialty goods. Convenience goods were preferred to be delivered faster than shopping, or specialty goods. Table 14 shows the factors that were significantly affected by a trade-offs for lower delivery speed and pick-up. Positive effects are indicated by a green font and negative effects by a red font.

Table 14: Differences found between consumer characteristics and product groups

<i>Lower delivery speed</i>	<i>Pick-up yourself</i>
<i>Age</i>	<i>Age</i>
<i>Income</i>	<i>Income</i>
<i>Education</i>	<i>Education</i>
<i>Living place</i>	<i>Living place</i>
<i>Value of time</i>	<i>Value of time</i>
<i>Household attendance</i>	<i>Household attendance</i>
<i>Product groups</i>	<i>Product groups</i>

5.2 Limitations and further research

Although we carefully planned and executed this study, several limitations should be mentioned that can provide directions for future research. The first limitation concerns the educational level of our sample, which contains a high percentage of higher educated respondents (HBO), which is more than the general numbers of the CBS represent. This creates a need for replicating this study with more representative groups.

Originally, this study would take place in Germany, Belgium and the Netherlands, however due to time constraints we only focused on the Dutch market. Therefore the results cannot be generalized across other countries and geographies. This leaves room for follow-up studies in other countries.

Furthermore, three different products were used to analyze the difference between product groups. Because web shops offer more products on their websites, this study can be extended in ways of including more product groups. Additionally, this study can also be extended by means of consumer characteristics.

Other interesting research opportunities are:

- What are consumer responses to dynamic shipping fees? Do they delay, cancel or purchase at a competitor and what is the consumer's price perception?
- Pricing provides a rich tool for demand management, but what are the opportunities for revenue management?
- What are the influences of pick-up in-store on the returning of goods?
- What is the potential for additional purchases when consumer chose to pick-up their goods?
- What are the effects of shipping fees on logistics handling?

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7 Appendices

Appendix A: Questionnaire

Deel 1: Afleversnelheid en betalingsbereidheid

Man / Vrouw

Het eerste deel van deze enquête gaat over uw online koopgedrag.

1. Hoe vaak bestelt u online? (wat komt het meest in de buurt)

*Indien nooit, ga verder met vraag 10

- Elke week Elke maand Eens tot vier keer per jaar Nooit

2. Wat is voor u de belangrijkste reden om online te winkelen?

- Online winkelen wanneer het mij uitkomt
 Prijsniveau (vergelijking)
 Productbeschikbaarheid/Uitgebreid assortiment
 Anders

3. Kunt u aangeven in hoeverre u het met de volgende stellingen eens bent?

	Helemaal mee oneens	Oneens	Neutraal	Eens	Helemaal mee eens
Ik vind betalen via Internet onbetrouwbaar					
Ik vind de verzendkosten te hoog					
Ik weet vooraf goed wanneer mijn pakketje wordt bezorgd					
Ik koop liever in een winkel dan op Internet					
Ik ervaar dat pakketjes doorgaans te laat worden bezorgd					
Ik heb vaker dan 1 op de 10 pakketjes beschadigd ontvangen					
Ik heb altijd drukke agenda					
Ik wil zelf kunnen bepalen wanneer pakjes worden bezorgd					
In mijn huishouden is altijd iemand aanwezig					
Ik zou vaker online bestellen indien de bezorging naar wensen is					

Deel 2: Afhalen van uw bestelling

Tegenwoordig bieden steeds meer webwinkels de mogelijkheid om het product in de winkel of bij een postkantoor op te halen.

4. Stel u haalt uw bestelling gratis af, kunt u aangeven hoe u de onderstaande afleveropties waardeert?

*(Aan te geven op een schaal van 1 tot 5, waarbij 1 een lage waardering is en waarbij 5 een hoge waardering is).

- Afhalen in een filiaal van de keten waar u het product heeft aangeschaft. 1 – 2 – 3 – 4 – 5
- Afhalen bij een afhaalpunt. 1 – 2 – 3 – 4 – 5

5. Stel u bestelt een jeans ter waarde van € 119,95 online en de web shop biedt de volgende prijs en afleveroptie, op een schaal van 1 t/m 5, hoe zou u deze aanbieding waarderen?

*(Aan te geven op een schaal van 1 tot 5, waarbij 1 lage waardering is en waarbij 5 hoge waardering is).



Prijs € 119,95

- | | |
|----------------|-----------------------|
| Kaart nummer 1 | 1----2----3----4----5 |
| Kaart nummer 2 | 1----2----3----4----5 |
| Kaart nummer 3 | 1----2----3----4----5 |
| Kaart nummer 4 | 1----2----3----4----5 |
| Kaart nummer 5 | 1----2----3----4----5 |

Stapel

Wat zijn de eerste 4 cijfers van uw postcode?

Postcode: _ _ _ _

6. Stel de verzendkosten voor 24 uur levering zijn hoger dan u zou willen betalen, in hoeverre zijn de volgende alternatieven op u van toepassing?

_(Aan te geven op een schaal van 1 tot 5, waarbij 1 niet van toepassing is en waarbij 5 zeer van toepassing is).

- Laten bezorgen binnen 2-5 dagen, met minder verzendkosten 1 – 2 – 3 – 4 – 5
- Gratis afhalen van uw bestelling 1 – 2 – 3 – 4 – 5

Deel 3: Bezorgen op afspraak

Tegenwoordig bieden steeds meer webwinkels de mogelijkheid om het product op de door u gewenste dag en tijdvak te bezorgen.

7. Stelt u koopt vandaag een jeans online ter waarde van € 119,95 en u weet dat u morgen niet thuis bent. Naar welke afleveroptie gaat uw voorkeur uit?

**(Aan te geven op een schaal van 1 tot 5, waarbij 1 niet belangrijk is en waarbij 5 zeer belangrijk is).*

- De jeans als nog morgen laten bezorgen en indien mogelijk bij de burens. 1 – 2 – 3 – 4 – 5
- De jeans laten bezorgen op een door u gekozen dag in de komende week. 1 – 2 – 3 – 4 – 5

8. Stel u bestelt een Jeans ter waarde van € 119,95 online en u laat het bezorgen op de door u aangegeven dag, op een schaal van 1 t/m 5, hoe zou u deze afleveroptie waarderen?



Prijs € 119,95

Een tijdvak van 2 uur is bijvoorbeeld tussen 09:00 en 11:00 uur of 14:00 en 16:00 uur.

Een tijdvak van 4 uur is bijvoorbeeld tussen 10:00 en 14:00 uur of 13:00 en 17:00 uur.

Een tijdvak van 8 uur is overdag tussen 09:00 en 17:00 uur op een door u gekozen dag.

**(Aan te geven op een schaal van 1 tot 5, waarbij 1 lage waardering is en waarbij 5 hoge waardering is).*

Kaart nummer 1	1----2----3----4----5
Kaart nummer 2	1----2----3----4----5
Kaart nummer 3	1----2----3----4----5
Kaart nummer 4	1----2----3----4----5
Kaart nummer 5	1----2----3----4----5
Kaart nummer 6	1----2----3----4----5

Stapel

Deel 4: Algemene vragen

In dit deel van de enquête komen algemene vragen aan de orde. Wij zijn hierbij geïnteresseerd in verschillende consumentenprofielen.

9. Wat is uw voorkeur met betrekking tot de volgende stellingen:

Je kunt niet voorzichtig genoeg zijn in omgang met andere mensen

1-----2-----3-----4-----5-----6-----7

De meeste mensen zijn te vertrouwen

De meeste mensen zouden proberen misbruik van mij te maken

1-----2-----3-----4-----5-----6-----7

De meeste mensen zouden proberen eerlijk te zijn

Mensen denken meestal aan zichzelf

1-----2-----3-----4-----5-----6-----7

Mensen proberen meestal behulpzaam te zijn

In welke van de twee webwinkels heeft u meer vertrouwen:

Webwinkels met fysieke winkels

Webwinkels zonder fysieke winkels

|-----|-----|

10. Wat is uw leeftijd?

11. Kunt u aangeven in welke categorie uw bruto jaarinkomen valt?

Uiteraard kunt u het ook aangeven als u geen antwoord wilt geven op deze vraag.

- Onder modaal (< € 32.000 per jaar)
- Modaal (€ 33.000 bruto per jaar)
- Boven modaal (> € 40.000 per jaar)
- Geen antwoord

12. Wat is uw hoogst genoten opleiding?

.....

Appendix B: Delivery options of the web shops in the Dutch market and CBS sample comparisons.

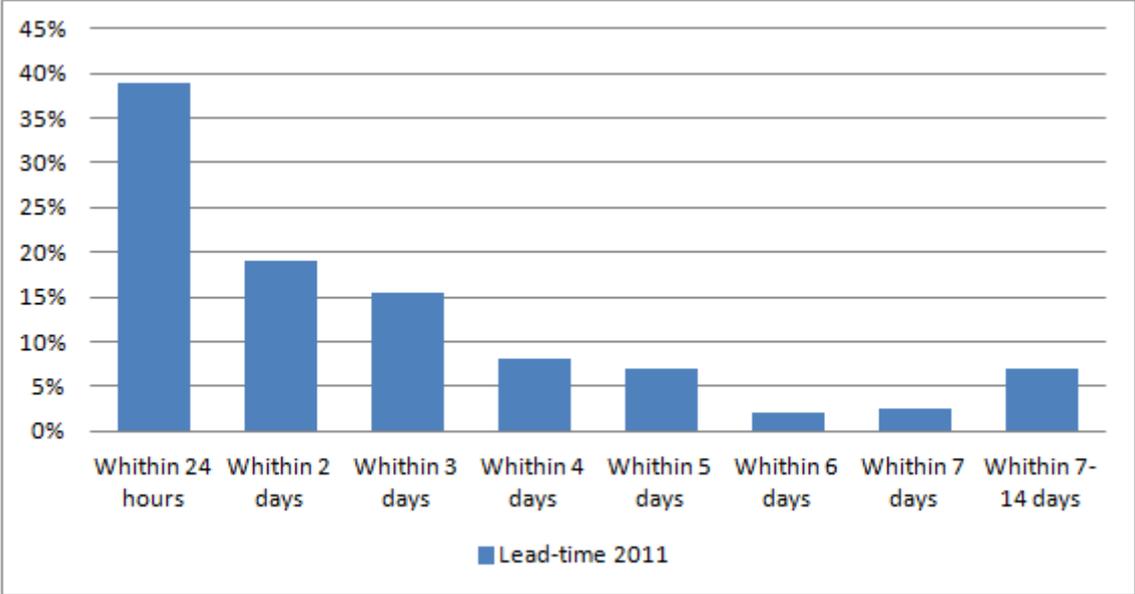


Figure 1: Lead-times in (home) delivery in the Netherlands (DeliveryMatch, 2011)

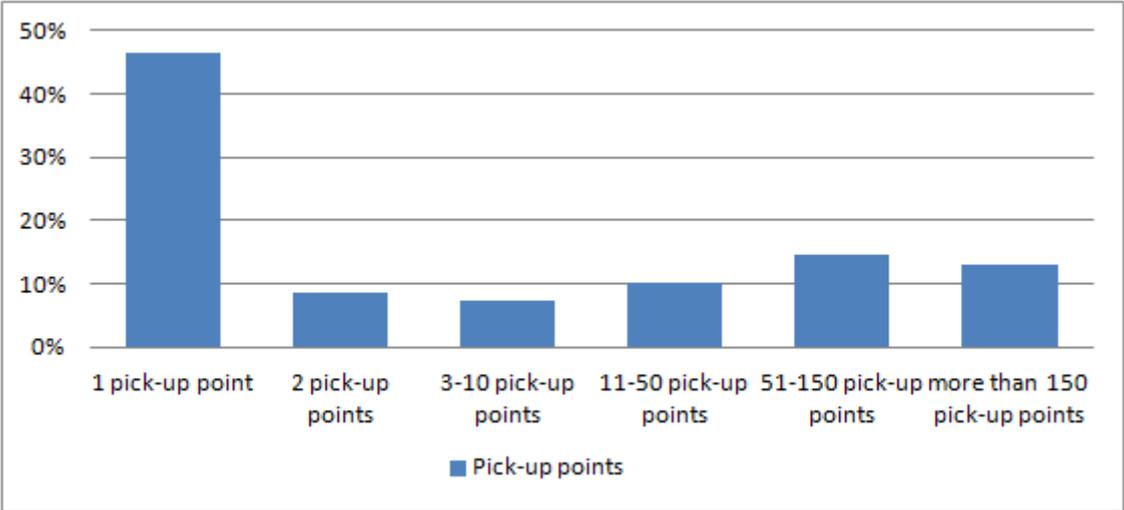


Figure 2: Pick-up options web shops offer in the Netherlands (Deliverymatch, 2011)

Appendix C: Sample population comparison to CBS population

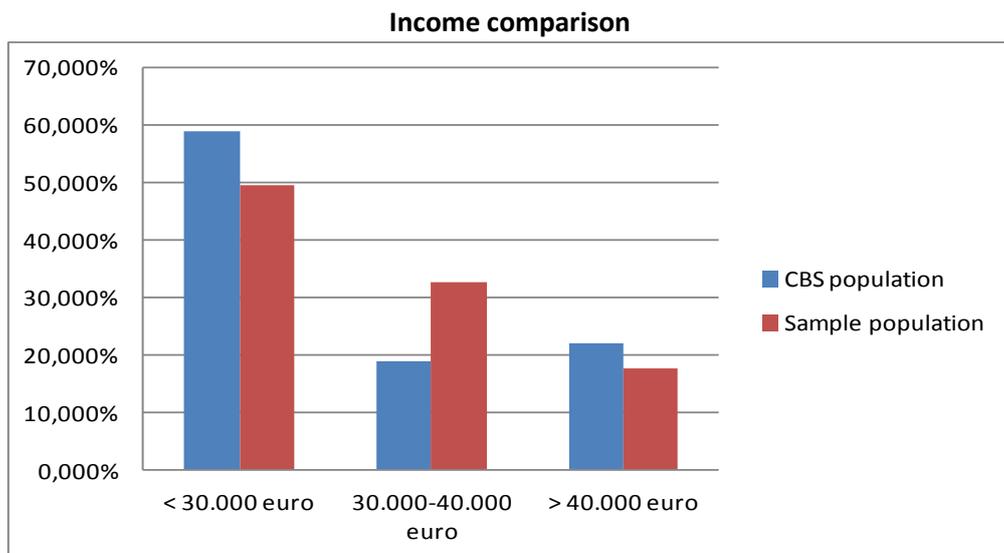


Figure 3: Income comparison (Source: <http://statline.cbs.nl/StatWeb/publication/?VW=T&DM=SLNL&PA=71510ned&LA=NL>)

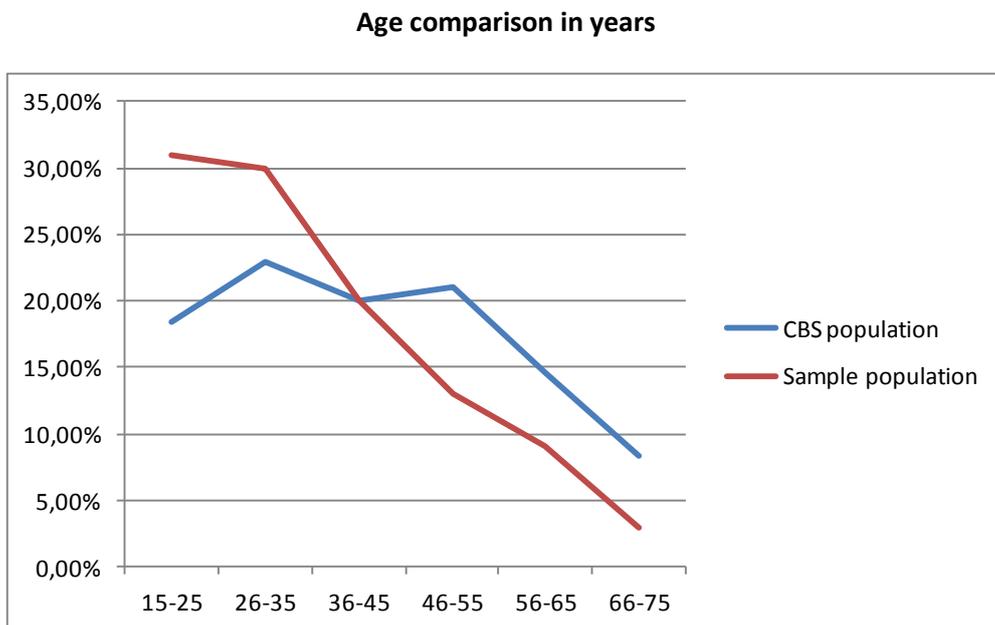


Figure 4: Age comparison, (Source: <http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=71098NED&D1=114-117,119-122&D2=1-2,8-13&D3=I&HDR=G1&STB=T,G2&VW=T>)

Education comparison

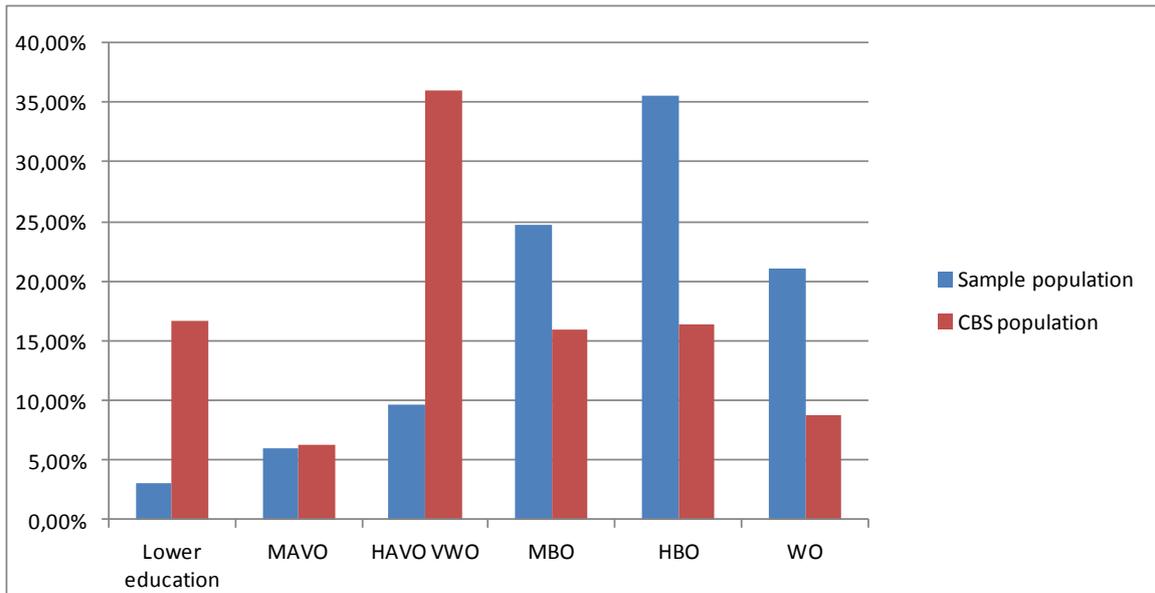


Figure 5: Education comparison (Source: <http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=71822NED&D1=1&D2=0&D3=0&D4=0&D5=1-10&D6=a&D7=l&HDR=T,G6,G2,G5,G3&STB=G1,G4&VW=T>)

Appendix D: Conjoint analysis and additional Kruskal-Wallis Test

Utilities Delivery speed

		Utility Estimate	Std. Error
Delivery speed	24-hour delivery	,262	,070
	2-5 day delivery	-,262	,070
Price	4 euro	,533	,140
	6 euro	-,368	,140
	10 euro	-,830	,140
	14 euro	-1,088	,140
	Free	1,753	,140
Product category	Convenience goods	-,362	,099
	Shopping goods	-,026	,099
	Specialty goods	,388	,099
(Constant)		2,762	,070

Importance Values

Lead_time	11,544
Price	67,168
Product_group	21,287

Averaged Importance Score

Correlations^a

	Value	Sig.
Pearson's R	,959	,000
Kendall's tau	,836	,000

a. Correlations between observed and estimated preferences

Utilities Deliver location

		Utility Estimate	Std. Error
Delivery_option	Pick-up	-,202	,173
	Home delivery	,202	,173
Product_group	Convenience	-,204	,245
	Shopping	,147	,245
	Specialty	,058	,245
Price	Free	1,093	,245
	4 euro	-,258	,245
	6 euro	-,835	,245
(Constant)		2,675	,173

Importance Values (delivery locations)

Delivery_option	17,179
Product_group	22,320
Price	60,501

Averaged Importance Score

Correlations^a (delivery locations)

	Value	Sig.
Pearson's R	,816	,000
Kendall's tau	,713	,000

a. Correlations between observed and estimated preferences

APPENDIX E: Differences between product groups

	Product	N	Mean Rank
	1,00	25	37,52
Delivery	2,00	28	40,64
location_preference	3,00	22	35,18
	Total	75	

	Delivery location_preference
Chi-Square	,890
df	2
Asymp. Sig.	,641

a. Kruskal Wallis Test

b. Grouping Variable: Product

LAPTOP VS BOOK

	KRUSKAL_Product_group	N	Mean Rank	Sum of Ranks
Pickup_due_fee	laptop	56	49,71	2783,50
	boek	46	53,68	2469,50
	Total	102		
Longer_delivery_due_fee	laptop	56	45,11	2526,00
	boek	48	61,13	2934,00
	Total	104		

	Pickup_due_fee	Longer_delivery_due_fee
Mann-Whitney U	1187,500	930,000
Wilcoxon W	2783,500	2526,000
Z	-,708	-2,847
Asymp. Sig. (2-tailed)	,479	,004

a. Grouping Variable: KRUSKAL_Product_group

BOOK VS JEANS

Ranks

	KRUSKAL_Product_group	N	Mean Rank	Sum of Ranks
Pickup_due_fee	jeans	38	41,41	1573,50
	boek	46	43,40	1996,50
	Total	84		
Longer_delivery_due_fee	jeans	48	34,18	1640,50
	boek	48	62,82	3015,50
	Total	96		

Test Statistics^a

	Pickup_due_fee	Longer_delivery _due_fee
Mann-Whitney U	832,500	464,500
Wilcoxon W	1573,500	1640,500
Z	-,385	-5,348
Asymp. Sig. (2-tailed)	,700	,000

a. Grouping Variable: KRUSKALL_Product_group

APENDIX F: Differences in shipping fees

Test Statistics^a

	€ 0
Z	-4,738 ^b
Asymp. Sig. (2-tailed)	,000

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

Test Statistics^a

	€ 2	€ 4
Z	-4,039 ^b	-551 ^b
Asymp. Sig. (2-tailed)	,000	,581

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

Test Statistics^a

	€ 6
Z	-,774 ^b
Asymp. Sig. (2-tailed)	,439

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

Test Statistics^a

	€ 10
Z	-1,645 ^b
Asymp. Sig. (2-tailed)	,100

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Test Statistics^a

	€ 14
Z	-7,341 ^b
Asymp. Sig. (2-tailed)	,000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Delivery locations**Test Statistics^a**

	€ 0
Z	-4,212 ^b
Asymp. Sig. (2-tailed)	,000

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

Test Statistics^a

	€ 2
Z	-3,586 ^b
Asymp. Sig. (2-tailed)	,000

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

Test Statistics^a

	€ 4
Z	-2,642 ^b
Asymp. Sig. (2-tailed)	,008

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Test Statistics^a

	€ 6
Z	-,696 ^b
Asymp. Sig. (2-tailed)	,486

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

Appendix G: Hypotheses 4, Kruskal-Wallis and Mann-Whitney U Test

1: Living place (Mann-Whitney U Test)

Ranks				
	Urbanicity	N	Mean Rank	Sum of Ranks
Delivery_speed	Urban	100	75,61	7561,00
	Rural	52	78,21	4067,00
	Total	152		
Delivery_location	Urban	100	80,73	8072,50
	Rural	52	68,38	3555,50
	Total	152		
Longer_lead_timw	Urban	93	71,19	6620,50
	Rural	47	69,14	3249,50
	Total	140		
Pick_up_Due_fee	Urban	100	85,41	8541,00
	Rural	52	59,37	3087,00
	Total	152		

Test Statistics ^a				
	Delivery_speed	Delivery_locatio n	Longer_lead_ti mw	Pick_up_Due_f ee
Mann-Whitney U	2511,000	2177,500	2121,500	1709,000
Wilcoxon W	7561,000	3555,500	3249,500	3087,000
Z	-,354	-1,728	-,297	-3,639
Asymp. Sig. (2-tailed)	,723	,084	,766	,000

Report

Pick_up_Due_fee

POSTCODE	Median	N
Urban	2,0000	100
Rural	1,0000	52
Total	2,0000	152

2: Education (Mann-Whitney U Test)

Ranks

	EDUCATION	N	Mean Rank	Sum of Ranks
Delivery_speed	Lower education	72	74,31	5350,00
	Higher education	78	76,60	5975,00
	Total	150		
Delivery_location	Lower education	72	78,25	5634,00
	Higher education	78	72,96	5691,00
	Total	150		
Longer_lead_timw	Lower education	65	72,82	4733,00
	Higher education	75	68,49	5137,00
	Total	140		
Pick_up_Due_fee	Lower education	72	72,85	5245,50
	Higher education	78	77,94	6079,50
	Total	150		

Test Statistics^a

	Delivery_speed	Delivery_locatio n	Longer_lead_ti mw	Pick_up_Due_f ee
Mann-Whitney U	2722,000	2610,000	2287,000	2617,500
Wilcoxon W	5350,000	5691,000	5137,000	5245,500
Z	-,331	-,784	-,662	-,754
Asymp. Sig. (2-tailed)	,740	,433	,508	,451

a. Grouping Variable: EDUCATION

3: Income (Kruskal-Wallis Test + Post-hoc Mann-Whitney U Test)

Test Statistics^{a,b}

	Delivery_speed	Longer_lead_ti mw	Pick_up_Due_f ee	Delivery_locatio n
Chi-Square	3,473	27,453	14,751	2,720
df	2	2	2	2
Asymp. Sig.	,176	,000	,001	,257

a. Kruskal Wallis Test

b. Grouping Variable: INCOME

Ranks

	INCOME	N	Mean Rank
Delivery_speed	< modal	60	82,04
	modal	64	76,89
	> modal	28	63,73
	Total	152	
Longer_lead_timw	< modal	54	92,00
	modal	61	60,09
	> modal	25	49,46
	Total	140	
Pick_up_Due_fee	< modal	60	91,56
	modal	64	71,21
	> modal	28	56,32
	Total	152	
Delivery_location	< modal	60	69,52
	modal	64	80,48
	> modal	28	82,38
	Total	152	

Mann-Whitney U: < Income vs. Higher income

Ranks				
	INCOME	N	Mean Rank	Sum of Ranks
Delivery_speed	< modal	60	47,88	2872,50
	> modal	28	37,27	1043,50
	Total	88		
Delivery_location	< modal	60	42,26	2535,50
	> modal	28	49,30	1380,50
	Total	88		
Longer_lead_timw	< modal	54	46,81	2527,50
	> modal	25	25,30	632,50
	Total	79		
Pick_up_Due_fee	< modal	60	50,40	3024,00
	> modal	28	31,86	892,00
	Total	88		

Test Statistics ^a				
	Delivery_speed	Delivery_locatio n	Longer_lead_ti mw	Pick_up_Due_f ee
Mann-Whitney U	637,500	705,500	307,500	486,000
Wilcoxon W	1043,500	2535,500	632,500	892,000
Z	-1,856	-1,254	-3,997	-3,292
Asymp. Sig. (2-tailed)	,063	,210	,000	,001

a. Grouping Variable: INCOME

Income: Modal vs. Higher than modal

Ranks				
	INCOME	N	Mean Rank	Sum of Ranks
Delivery_speed	modal	64	48,92	3131,00
	> modal	28	40,96	1147,00
	Total	92		
Delivery_location	modal	64	46,03	2946,00
	> modal	28	47,57	1332,00
	Total	92		
Longer_lead_timw	modal	61	45,90	2800,00
	> modal	25	37,64	941,00
	Total	86		
Pick_up_Due_fee	modal	64	49,80	3187,00
	> modal	28	38,96	1091,00
	Total	92		

Test Statistics ^a				
	Delivery_speed	Delivery_locatio	Longer_lead_ti	Pick_up_Due_f
		n	mw	ee
Mann-Whitney U	741,000	866,000	616,000	685,000
Wilcoxon W	1147,000	2946,000	941,000	1091,000
Z	-1,346	-,262	-1,455	-1,883
Asymp. Sig. (2-tailed)	,178	,793	,146	,060

a. Grouping Variable: INCOME

Income: Lower than modal vs. Modal income

Ranks				
	INCOME	N	Mean Rank	Sum of Ranks
Delivery_speed	< modal	60	64,67	3880,00
	modal	64	60,47	3870,00
	Total	124		
Delivery_location	< modal	60	57,76	3465,50
	modal	64	66,95	4284,50
	Total	124		
Longer_lead_timw	< modal	54	70,98	3833,00
	modal	61	46,51	2837,00
	Total	115		
Pick_up_Due_fee	< modal	60	71,66	4299,50
	modal	64	53,91	3450,50
	Total	124		

Test Statistics ^a				
	Delivery_speed	Delivery_locatio	Longer_lead_ti	Pick_up_Due_f
		n	mw	ee
Mann-Whitney U	1790,000	1635,500	946,000	1370,500
Wilcoxon W	3870,000	3465,500	2837,000	3450,500
Z	-,668	-1,478	-4,033	-2,828
Asymp. Sig. (2-tailed)	,504	,139	,000	,005

a. Grouping Variable: INCOME

4: AGE, Kruskal-Wallis Test

Test Statistics ^{a,b}				
	Delivery_speed	Longer_lead_ti	Pick_up_Due_f	Delivery_locatio
		mw	ee	n
Chi-Square	,061	8,275	2,809	1,792
df	2	2	2	2
Asymp. Sig.	,970	,016	,246	,408

a. Kruskal Wallis Test

b. Grouping Variable: AGE

Ranks

	AGE	N	Mean Rank
Delivery_speed	1,00	24	76,56
	2,00	87	75,07
	3,00	38	73,86
	Total	149	
Longer_lead_timw	1,00	21	93,17
	2,00	81	67,36
	3,00	38	64,67
	Total	140	
Pick_up_Due_fee	1,00	24	86,71
	2,00	87	74,61
	3,00	38	68,50
	Total	149	
Delivery_location	1,00	24	68,85
	2,00	87	73,52
	3,00	38	82,28
	Total	149	

Age: <24 years vs 25-44 years

Ranks

	AGE	N	Mean Rank	Sum of Ranks
Delivery_speed	<24 years	24	56,83	1364,00
	25-44 years	87	55,77	4852,00
	Total	111		
Delivery_location	<24 years	24	53,17	1276,00
	25-44 years	87	56,78	4940,00
	Total	111		
Longer_lead_timw	<24 years	21	66,26	1391,50
	25-44 years	81	47,67	3861,50
	Total	102		
Pick_up_Due_fee	<24 years	24	63,08	1514,00
	25-44 years	87	54,05	4702,00
	Total	111		

Test Statistics^a

	Delivery_speed	Delivery_locatio n	Longer_lead_ti mw	Pick_up_Due_f ee
Mann-Whitney U	1024,000	976,000	540,500	874,000
Wilcoxon W	4852,000	1276,000	3861,500	4702,000
Z	-,147	-,508	-2,642	-1,256
Asymp. Sig. (2-tailed)	,883	,611	,008	,209

a. Grouping Variable: AGE

Age: 25-44 vs. >44

Ranks

	AGE	N	Mean Rank	Sum of Ranks
Delivery_speed	25-44 years	87	63,30	5507,00
	>45 years	38	62,32	2368,00
	Total	125		
Delivery_location	25-44 years	87	60,74	5284,00
	>45 years	38	68,18	2591,00
	Total	125		
Longer_lead_timw	25-44 years	81	60,69	4915,50
	>45 years	38	58,54	2224,50
	Total	119		
Pick_up_Due_fee	25-44 years	87	64,56	5617,00
	>45 years	38	59,42	2258,00
	Total	125		

Test Statistics^a

	Delivery_speed	Delivery_locatio n	Longer_lead_ti mw	Pick_up_Due_f ee
Mann-Whitney U	1627,000	1456,000	1483,500	1517,000
Wilcoxon W	2368,000	5284,000	2224,500	2258,000
Z	-,143	-1,092	-,326	-,756
Asymp. Sig. (2-tailed)	,886	,275	,744	,450

a. Grouping Variable: AGE

Age: <24 vs >45

Ranks				
	AGE	N	Mean Rank	Sum of Ranks
Delivery_speed	<24 years	24	32,23	773,50
	>45 years	38	31,04	1179,50
	Total	62		
Delivery_location	<24 years	24	28,19	676,50
	>45 years	38	33,59	1276,50
	Total	62		
Longer_lead_timw	<24 years	21	37,90	796,00
	>45 years	38	25,63	974,00
	Total	59		
Pick_up_Due_fee	<24 years	24	36,13	867,00
	>45 years	38	28,58	1086,00
	Total	62		

Test Statistics ^a				
	Delivery_speed	Delivery_locatio	Longer_lead_ti	Pick_up_Due_f
		n	mw	ee
Mann-Whitney U	438,500	376,500	233,000	345,000
Wilcoxon W	1179,500	676,500	974,000	1086,000
Z	-,261	-1,188	-2,695	-1,658
Asymp. Sig. (2-tailed)	,794	,235	,007	,097

a. Grouping Variable: AGE

Household attendance (low vs. high)

Test Statistics ^a				
	Delivery_speed	Delivery_locatio	Longer_lead_ti	Pick_up_Due_f
		n	mw	ee
Mann-Whitney U	1815,500	1692,500	1632,000	1889,500
Wilcoxon W	2481,500	2358,500	2160,000	8675,500
Z	-1,210	-1,777	-,490	-,889
Asymp. Sig. (2-tailed)	,226	,076	,624	,374

a. Grouping Variable: Household_attendance

Ranks

	Household_attendance	N	Mean Rank	Sum of Ranks
Delivery_speed	low attendance	116	78,85	9146,50
	high attendance	36	68,93	2481,50
	Total	152		
Delivery_location	low attendance	116	79,91	9269,50
	high attendance	36	65,51	2358,50
	Total	152		
Longer_lead_time	low attendance	108	71,39	7710,00
	high attendance	32	67,50	2160,00
	Total	140		
Pick_up_Due_fee	low attendance	116	74,79	8675,50
	high attendance	36	82,01	2952,50
	Total	152		

Value of time (low vs high)

Ranks

	VOT	N	Mean Rank	Sum of Ranks
Delivery_speed	not busy	68	75,71	5148,00
	busy	84	77,14	6480,00
	Total	152		
Delivery_location	not busy	68	69,21	4706,00
	busy	84	82,40	6922,00
	Total	152		
Longer_lead_timw	not busy	62	71,72	4446,50
	busy	78	69,53	5423,50
	Total	140		
Pick_up_Due_fee	not busy	68	72,48	4928,50
	busy	84	79,76	6699,50
	Total	152		

Test Statistics^a

	Delivery_speed	Delivery_locatio	Longer_lead_ti	Pick_up_Due_f
		n	mw	ee
Mann-Whitney U	2802,000	2360,000	2342,500	2582,500
Wilcoxon W	5148,000	4706,000	5423,500	4928,500
Z	-,205	-1,891	-,326	-1,047
Asymp. Sig. (2-tailed)	,838	,059	,745	,295

a. Grouping Variable: VOT