

E-commerce Related Last Mile Logistics — The Prospect Towards Sustainable Last Mile Logistics in Urban Areas

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Abstract

E-commerce activities have been growing rapidly throughout the past decade, leading to a growth just as dominant in last mile logistics and urban freight transport as well. Different factors create these deliveries highly inefficient, expensive, and polluting. This led to the generation of major problems that became more dominant in urban areas. Such problems created in cities contributed to higher traffic, air pollution and more accidents caused just to name a few. Parallely, the concept of sustainability has been becoming more popular and used as environmental concerns on consuming activities are growing. Therefore, this paper is aiming to discover what impacts exactly urban freight transport is making on urban areas as well as if e-commerce customers' interest is appearing in sustainable last mile logistics. The following research questions are made: "How does the last mile freight logistics impact the environmental sustainability aspect in urban areas?" and "Are the customer's interest and perception correlated with the use of sustainable last mile delivery in fashion e-commerce in Sweden?". These questions are answered through a literature review and a quantitative survey study that has received more than 100 answers and these were analyzed with the help of the SPSS software.

Through the theoretical lens, E--commerce related last mile logistics show highly negative environmental concerns on cities due to many factors such as freight transport, and tight delivery windows. Empirically, the originality of this thesis is that it unfolds customer perceptions and their correlation with the use of sustainable last mile deliveries. The Spearman tests show a significant correlation between customer perception and the use of sustainable last mile logistics through the studied aspects (time, price, service quality and delivery methods). The aim of this study is fulfilled, and the results show that consumers have no interest towards the use of sustainable last mile delivery as long as it is not convenient and suits their priorities. On the other hand, some other factors are shown and considered to be a part in affecting their interest to behave sustainably such as the misleading information conveyed by the companies and deceiving consumers about being environmentally friendly and the lack of knowledge on how to distinguish that the service is sustainable. These results are hopefully useful for online retailers, and different governmental or non-governmental organizations, who are aiming for sustainable logistical solutions, to get a better understanding of customer perceptions.

Keywords: Urban freight flow, freight last mile logistics, LML typology, Sustainable LML, last mile delivery.

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Table of Contents

1	Introduction	1
	1.1. Study Background	1
	1.2. Research aim and research question	3
	1.3. Thesis structure	4
2	Literature review	6
	2.1. Last mile definitions	6
	2.2. Urban freight last mile logistics	7
	2.3. Typologies and characteristics of LML	8
	2.4. How sustainable are different delivery methods?	12
	2.4.1. Standard home delivery	12
	2.4.2. Pick up point	13
	2.4.3. Pick up at stores	14
	2.4.4. Same day delivery	14
	2.4.5. Sustainable delivery	15
	2.5. Sustainable urban freight transport	15
	2.5.1. What is sustainability?	15
	2.5.2. What is sustainable urban transport?	17
	2.5.3. Impact of Urban Freight Transport	18
	2.6. E-commerce and Fashion	20
	2.6.1. Fashion e-commerce in relation to last mile logistics	20
	2.6.2. Customer perceptions on e-commerce and service quality	21
	2.6.2.a Perceived risk	21
	2.6.2.b Technology Acceptance Model	22
	2.6.2.c Customer Intentions in e-commerce	23
	2.6.3. Customer perception and intention about sustainable last mile logistics	23
	2.6.3.a Last mile delivery in e-commerce	23
	2.6.3.b Sustainable last mile and customers	24
	2.6.3.c Omnichannel retailing, pick up in stores	25
	2.6.3.d Customer intentions in last mile	26
	2.6.3.e Sustainable consumption	27
	2.7. Theoretical framework	27
3	Methodology	32
	3.1. Research approach	32

3.2. Research strategy and design	34
3.3. Case selection	35
3.4. Data sampling	35
3.5. Data collection	36
3.6. Data analysis	36
3.7. Research quality	37
3.8. Ethical consideration	37
3.9. Limitations	38
4 Results	39
4.1. Results	39
4.2. Data analysis	51
4.2.1. Customers' attitudes towards sustainability	51
4.2.2. Summarizing the data analysis	53
4.2.3. Suggestions to improve the delivery service	54
5 Discussion	57
6 Conclusion	62
6.1. Limitations	62
6.2. Future research	63
References	64
Appendix A – An Appendix	72
Appendix B – Another Appendix	75

List of Figures

Figure 1. Overall framework of Last Mile Logistics (Olsson et al., 2019).	9
Figure 2. Simplified structure of freight supply chain (Bosona, 2020). Dotted line: Signifies the focus area of freight LML in this study.	10
Figure 3. Typology of urban freight LML from logistics configuration point of view (Bosona, 2020).	12
Figure 4. The impact of E-commerce related last mile logistics on cities (Anderson et al., 2005).....	19
Figure 5. Theoretical framework of customer perception related-last mile delivery. Source: Author's own illustration.....	31
Figure 6. Research Strategies and Research Methods. Author's own illustration.	32
Figure 7. Distribution of gender among the respondents.	39
Figure 8. Distribution of the age of respondents.	40
Figure 9. Distribution of respondents who buy fashion online.	41
Figure 10. Distribution of respondents who purchase online per month.....	41
Figure 11. Distribution of the respondents according to towns.....	42
Figure 12. Distribution of the respondents according to the frequency of choosing different delivery methods.	42
Figure 13. Distribution of respondents according to the frequency of considering buying sustainable services.	43
Figure 14. Distribution of respondents who they have to sacrifice aspects in service quality to be sustainable.	44
Figure 15. Distribution of respondents who might change their purchasing habits if the company offered more sustainable delivery options.....	44
Figure 16. Distribution of respondents who believe that retailers should take responsibility to act on sustainability.....	45
Figure 17. Level of trust of respondents towards the distributors' claims about sustainable service. ..	45

List of Tables

Table 1. Case processing summary	46
Table 2. Case processing summary 2	47
Table 3. Spearman's Correlation between caring about sustainability and fast delivery.....	48
Table 4. Spearman's Correlation between caring about sustainability and price.	48
Table 5. Spearman's Correlation between caring about sustainability and sustainable service quality.	49
Table 6. Spearman's Correlation between caring about sustainability and the company that delivers.	50
Table 7. Spearman's Correlation between caring about sustainability and considering purchasing sustainable services.	50

List of Abbreviations

B2C - business to customer
CDP - collection and delivery point
DC - distribution center
GHG - greenhouse gas
LDC - local distribution center
LMD - last mile delivery
LMF - last mile fulfillment
LML - last mile logistics
LMT - last mile transport
NGO - non-governmental organization
PP - pick up point
TAM - Technology Acceptance Model
TBL - Triple Bottom Line
UFT - urban freight transport
VKT - vehicles kilometer travel

1. Introduction

1.1 Study background

For the past decade, electronic commerce, especially e-shopping has been accelerated rapidly as a part of the global economy in digital activities, due to the Covid 19 pandemic that has occurred all over the world (Souter, 2021). This has led to a subsequent increase in last-mile deliveries connected with online sales (Wang et al., 2019). As the trend of urbanization is persisting globally, more and more people are living, working, and thus commuting through which cities have become more populated and denser (Browne et al., 2012). Consecutively, the freight flow in urban areas has noticeably increased (Nenni et al., 2019). Urban areas are defined as areas with non-agricultural activities, with economic and social organisations and concentrated population, but it can change from country to country what population is considered as urban (Weeks, 2010).

Last-mile delivery is the crucial part that retailers constantly attempt to develop to become outstanding in the service. However, the boost of cybershopping and the substantial increase in the number of deliveries directly to the customers, arose with several problems making the last mile inefficient, highly expensive and the most polluting part in the supply chain (Gevaers et al., 2009). Consequently, an efficient logistics system is extremely significant for the urban areas in terms of competitiveness and the urban economic system (Quak, 2008). As explained in Michaelis (2003), firms and corporates have a role in shifting global consumption towards sustainability, this can be done through dialogues with other stakeholders. This research would like to model this dialogue between customers and retailers to understand each other's perceptions and intentions.

However, despite being essential in sustaining urban life, several unsustainable effects are associated with freight transport (Quak, 2008). Such related problems include the greenhouse gas (GHG) emissions which contribute to global warming, traffic accidents, air and noise pollution, congestion, and destruction to the infrastructure such as road networks (Ranieri et al., 2018; Vissar et al., 2014). These problems imply a negative impact on the social, economic, and environmental aspects in cities all over the world (Dablanc, 2008). Therefore, to overcome these problems, an effective and efficient plan needs to be applied in advance to the urban last mile logistics and delivery methods.

The concept of sustainability has importantly increased due to the growing concerns about the environmental outcomes of human activities. Sustainability today has become the heart of corporate concerns where financial profitability is not the only goal chased by managers across the world. The green service practices or sustainable environment has been defined as the services provided while taking into consideration the sustainability of the environment (Goodman, 2000; Wolfson et al., 2010). Although the application of green practices has an increasing interest to improve the performance of firms and environment (Montabon et al., 2007; Subramanian et al., 2009), the attention is mostly restricted to the industrial context, as managing the environmental practices has a limited understanding in the service sector (Kassinis & Soteriou, 2009). From the perspective of service dominant logic, the service system is not significantly understood when differentiating between goods and service production (Vargo et al., 2008). There might be a little difference when it comes to the environmental impacts. The production of tangible products obviously consumes substances and raw materials that cause pollution and waste. Similarly, the service provision needs and consumes necessities that can harm the environment (Callaway & Dobrzykowski, 2009; Ellger & Scheiner, 2006). For instance, logistics as the most provisioned services required resources and equipment that need to be used in the service provision such as the fuel, trucks and material packaging which generate pollution when provided (Wong, 2012).

The common way to refer to sustainability is dividing them into three categories using the Triple Bottom Line (TBL) approach; in which sustainable activities could be achieved when corporations, governments and organizations fulfill three criteria: economic performance (conventional bottom line), social wealth creation, and environmental concern (The Economist, 2009). Further, according to the Economist (2009), Corporate profit is significant for the companies to ensure that the company will last in the long term. Therefore, the economic performance is an essential part of the triple bottom line approach to sustainability. Two additional objectives of the maximizing profits should be fulfilled. The second bottom line is to focus on people, by assessing the social impact of the corporate activities, in other words take into consideration their impact on human welfare. In the last mile delivery field, this can typically refer to the congestion issues, danger of accident and noise, health risk from pollution, all occurred due to the impact on traffic. The third bottom line refer to the planet; the environmental accountability, in which all the consequences that affect the environment must be considered such as the greenhouse gas (GHG) emission, waste management or the concern of biodiversity conservation. Hence, the TBL comprises three Ps: Profit, people and Planet (The

Economist, 2009). In the transportation industry, the sustainable environment is directly associated with the decrease of CO2 emission (Ducarme, 2019).

Fashion in this research is understood as products of textile, footwear, and accessories, the aesthetical or design value of these is not considered though. The industry is dominant in Scandinavian societies in different aspects (Melchior, 2011) and is thus found to be interesting to research and explore. The thesis is also based on the academic background of Service Dominant Logic, which model is the base of modern service management and also the understanding of this thesis, in the aspect of orienting towards the customers' understanding. Furthermore, it provides the understanding of co-created value between all actors including societal and economical. (Vargo & Lusch, 2004)

To understand last mile deliveries, typologies and characteristics are presented to illustrate the relationship between customers, distributors, and mediators such as pick up points. This typology also helps the research to base survey questions on and differentiate different methods in their effects on sustainability. As last mile deliveries are following the orders placed online, a framework is drawn on customer intentions in e-commerce. A quantitative research is designed on the grounds provided by a literature review on customer perception in the last mile and sustainable last mile deliveries. The results of the survey respondents are attained and analyzed using the statistical software program (SPSS).

1.2. Research aim and research question

The paper is intending to contribute to the academic understanding on sustainable last mile deliveries and customers intentions and perceptions on them. There is a wide range of research and articles available on sustainable last mile deliveries, such as Velazquez & Chankov (2019) or Ranieri et al. (2018), but an academic understanding of customer intentions and perceptions was found by this thesis to be missing while collecting the presented literature. Additionally, understanding customer perceptions is also valuable for business actors in the e-commerce and last mile industries (Wang et al., 2018). Therefore, this thesis is aiming to draw a general conceptual summary on the effects in urban areas of last mile logistics. This is followed by an empirical research based on the interest in customers' perception on sustainable last mile delivery service and its effects on the use of last mile delivery services. Empirically, this research will investigate the correlation between customers' perceptions who buy fashion online in Sweden and the use of sustainable last mile delivery service. The customers' perception in this study is about the certain aspects that consumers usually care about when

purchasing online and will be explored later through a theoretical lens. The objective of this study is to find out if the people who are living in Sweden and buy fashion online, care about the sustainable last mile delivery. Therefore, the following research questions will be addressed in this study:

RQ1. How does the last mile freight logistics impact the environmental sustainability aspect in urban areas?

RQ2. Are the customer's interest and perception correlated with the use of sustainable last mile delivery in fashion e-commerce in Sweden?

To answer the first research question, the challenges of urban freight last mile logistics on sustainability will be presented as well as the principles of sustainable development and the key concept for a sustainable urban transport. The question will be answered through a literature review exclusively and the findings will be discussed later under the Discussions chapter. The answer to this question will be mainly centered around the environmental impacts related to last mile logistics in urban areas, but the research is aware of related topics that are closely related to the environment such as the social and economic issues. Therefore, the question will be answered through the theoretical lens, based on the triple bottom line approach (price, people, planet), resulting from the activities of the two main components: (The last mile transport and last mile delivery). Such components will be considered together as they are considered strongly interrelated in the view of sustainability. These impacts will be further discussed centered further around the environmental impacts.

In the second question, quantitative research will be conducted using an online survey. To achieve the purpose of the study and answer our research question, a quantitative analysis was applied in which surveys will be distributed online on social media such as Canvas and Facebook groups to people who live in Sweden and most particularly for those who purchase fashion online. The results will be analyzed using the SPSS software. As the research will be conducted at the University of Lund, it is convenient to focus this study on Sweden. This research will not focus on e-commerce in general but on e-commerce related sustainable last mile delivery service.

1.3. Thesis structure

The structure of this thesis will continue as follows:

In the chapter of the literature review, relevant literature is introduced and sorted out around two research questions separately. The chapter presents literature on last mile delivery,

sustainable logistics, urban freight transport and its impacts are presented in the Discussion, where the first research question is answered. Then, relevant literature is presented, starting with fashion e-commerce, followed by customer perceptions in e-commerce and customer perceptions in sustainable last mile delivery. Based on the literature, the theoretical framework is created and explained by mentioning some important concepts that the customer considers when purchasing online. The theoretical framework allows the research to formulate two hypotheses (H1) and (H2) which have been supported later through the findings and analysis based on the statistical methods. The second research question is answered through the distributed questionnaire. More specifically, the correlation is studied by Spearman's test and the purpose is fulfilled through the descriptive statistics of certain aspects related to customer perception and analyzed based on the relevant literature using the statistical software platform (SPSS). In the methodology chapter, the methods applied are motivated and the data population of the research is explained. In the subsequent chapter, the results and data analysis of this study are presented. Here, the results are presented in detail and the hypotheses and the second research question are answered based on the findings. In the last chapter, discussion and conclusion are presented in which the discussion considers the answer of the first and second research question as well as the contributions. Last but not least, a summary is found under conclusion in addition to the research limitations and future research.

2. Literature Review

The chapter defines:

1. Last mile logistics and last mile delivery;
2. What is sustainable logistics, how does the research define and understand sustainability;
3. What is the urban freight transport, its challenges and what makes it sustainable;
4. The impacts of e-commerce related last mile logistics in urban areas.

In this chapter, previous works are assembled to provide an extended background and introduce related research for the current study. Last mile logistics is one noteworthy aspect of urban freight transport. Direct sales to consumers have increased significantly due to the increase of e-commerce and e-tailing, which in turn contribute to increasing the last mile delivery. However, the last mile is the least efficient, more costly, and highly polluting part in the flow of logistics.

Under this sense, and to make the reader be able to connect between the relevance of the recent study in the context of last mile delivery, it is important to provide a clear overview that involves the last mile delivery definitions, relating concepts, and introduce the challenges that are faced in the urban environment concerning the sustainable issue. The literature review starts from a broad background on the last mile and evolves in the direction of a focused lens of the sustainable delivery options and anticipated preferences of the customer perspectives.

2.1. Last mile definitions

Last mile is a term that was used before in telecommunication referring to the last stage of the telecommunication network (Lim et al., 2018). In the case of supply chain commodities, last mile logistics is the final stage of the supply chain (Bányai, 2018). Last-mile logistics (LML) is the final leg in the delivery service business to customer (B2C), in which the cargo is delivered to the recipient and collected either at the receiver's home or at the collection point and has become one of the obstructions of e-commerce (Gevaers et al., 2011). Conceptually, LML definition is identical for both, the transport of goods and public (Gevaers et al., 2014). This study will focus on the impact of last mile freight logistics in urban areas considering the environmental sustainability aspect, in which the term freight LML is used to unambiguously differentiate from the LML service of public transport.

LML is the true communication between the service provider and the customer. However, the definition of LML is quite constrained. A clear definition should be provided for LML in a way that identifies its scope along the products supply chain, which means exactly when it starts and ends (Bányai, 2018; Clausen et al., 2016). For instance, it is ambiguous if the term final leg refers to the transport segment between distribution center (DC) and destination (consumer home), or between local DC and final destination or between the pickup point and final destination. To avoid this misunderstanding, typologies, and classification of LML were provided (see section 2.3.).

Last mile has become an interesting topic due to the rapid growth of e-commerce and online shopping (Tiwapat et al., 2018). The volume of online sales has risen by 50% since the year 2013 (Barclays, 2014). Shopping online is convenient as the service provider offers several options for the customer such as the home delivery, pick up store and cash on delivery, as well as delivering the goods to the consumer's desired destination (Tiwapat et al., 2018). These choices are considered as a part of logistics which boost e-commerce, called the "Last mile delivery (LMD)" (Tiwapat et al., 2018).

Last mile is considered as the most expensive part in the supply chain, in which its cost ranges between 13% and 75% of the overall supply chain costs (Gevaers et al., 2011). Additionally, the last mile delivery challenges are not only limited to the high cost, but it also causes noises, traffic, air pollution and many other effects (Ranieri et al., 2018). Corresponding to that, managing the LMD appropriately, would have the possibility to reduce all effects substantially.

2.2. Urban freight last mile logistics (LML)

According to (OECD, 2003), freight transport is a major component of urban life. Citizens consume and utilize products like books, cars, computers, furniture, food, and clothes daily that are manufactured by people throughout the world. The goods transported in urban areas allow people to have access to these products everywhere at any time they need (Behrends et al., 2008). Thus, urban freight transport has played a significant role in meeting the citizens' needs, but simultaneously lead significantly to affect the economy, society, and environment negatively in the view of sustainability (Behrends et al., 2008).

The transport of goods in urban areas has substantially influenced the quality of life, economic power, accessibility, and attractiveness of local society (OECD, 2003). Urban freight

transport (UFT) definition varies among authors, but to serve the purpose of this thesis, the following definition has been considered: The movement of freight vehicles whose primary target is to bring cargo into, outside and within urban environments (MDS Transmodal, 2012).

Freight LML is deemed as a part of freight transport service. Freight transport has a significant role in the country's economy and has a raising trend (Bosona, 2020). Freight transport is the physical process of transferring goods, commodities and cargo by sea, air, or land (Cristina et al., 2006). The freight flow in urban areas is increasing (Nenni et al., 2019; Ranieri et al., 2018). This steady growth of urban freight is due to globalization, urbanization, population growth, economic development, densification, e-commerce and omnichannel retailing (Cardenas et al., 2017; Nenni et al., 2019; Ranieri et al., 2018). The good production locations are dispersed over large areas or countries due to globalization (Bosona, 2020). Thus, this in turn has contributed to increasing freight transport distances. In urban areas, the urban population was about 4.2 billion globally in 2018 and estimated to be 6.7 billion in 2050 (Nenni et al., 2019). Particularly, in Europe, the urban population was about 54% and is assessed to be 66% in 2050 (Ranieri et al., 2018). In EU-28 countries, the main freight transport modes are rail, road, and waterways (Bosona, 2020). The average data between the six years (2011-2016) in the EU 28 countries indicates that road transport represents about 75% of the interior freight transport and 18% of the rail (*Freight Transport Statistics - Modal Split.*, 2020). This implies that, when considering the road transport, freight LML has a substantial negative impact on sustainability of urban growth (Pronello et al., 2017). Additionally, the freight LML is already considered as fragmented and the most inefficient part of the goods supply chain (de Souza et al., 2014; Oliveira et al., 2017).

2.3. Typologies and characteristics of LML

There are many different aspects and facets of LML found in the literature. The logistics network configurations for goods delivery are applied differently by various firms (Wygonik & Goodchild, 2018). At the aggregated level, the logistics chain encompasses three main stages in urban freight transport. In the case of business to customer (B2C), the main actors of goods transmission in urban areas are: Shippers (producers or freight forwarders or wholesalers which also called consolidators), transport service providers (carriers), and Receivers (end consumers) (Nuzzolo et al., 2018).

Interestingly, the framework created by Olsson et al. (2019) has covered the key components and their interrelations identified from the literature. The framework has built on five interrelated elements which contains, last mile logistics, last mile distribution and three main elements: last mile fulfilment, last mile transport and last mile delivery, as shown in (Figure 1). The framework can be viewed from two perspectives. The first angle is the back end which is an element of the frame that encounters the sender, while the other angle is the front-end of the frame that encounters the receiver.

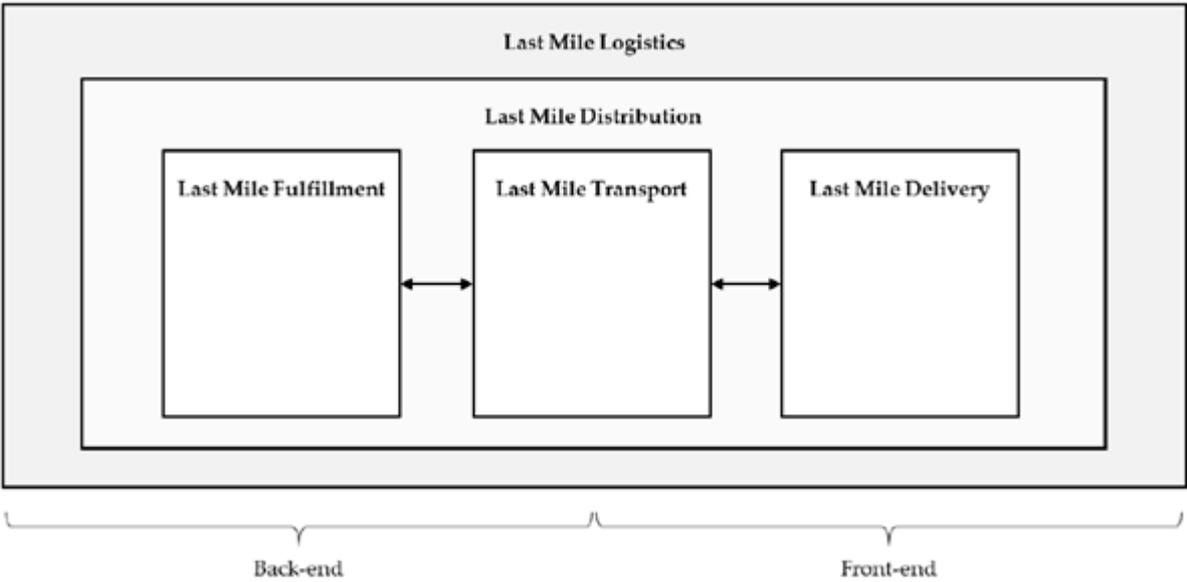


Figure 1. Overall framework of Last Mile Logistics (Olsson et al., 2019).

Based on the literature, the latter definition of LML has defined as being the final stretch of business to customer (B2C) parcel conveyance service (Lim et al., 2018), and meant to be a process of planning, fulfilling, and controlling effective and efficient shipping and storage of products, from the moment of ordering until attaining the final consumer (Olsson et al., 2019).

Recently, emerging models have progressed to the e-tailing business (electronic retailing business) which entails the multi-channels and omni-channels, altered many facets of distribution networks, like the network flow, and allowed customers to enjoy higher performance (Lim & Srari, 2018). Based on Figure 1., the main three components that has constructed by Olsson et al. (2019) means the following:

Last Mile Fulfillment (LMF) is the stage of fulfilling an order through making it ready to be delivered.

Last Mile Transport (LMT) is the stage of transporting the goods in the last mile by various means of vehicles such as heavy goods vehicles, light, electric, bikes, tricycles, or drones. This stage plays a vital role in the last mile delivery as being the interface between LMF and LMD.

Last Mile Delivery (LMD): is seen as the front-end of the LML and implies the vital activities of the physical transportation to the last destination selected by the receiver (Olsson et al., 2019).

Figure 2. shows a simplified structure of freight supply chain created by (Bosona, 2020) based on the literature. In this classification, the distribution center (DC) is deemed as the ending point of the commercial journey, seen as a regional storehouse or outside metropolis hub, and operates as a storage and distribution center. Thus, from the sustainable point of view, its strategic position is extremely significant. The sources of delivering the cargo to the DC can be imported internationally or conveyed from a national source. Local distribution center (LDC) could be a retailer store, local storehouse, mobile depot, consolidation center or transshipment point varying according to the various characteristics of LML service provided by the company. Pick up points (PPs) can represent the automatic lockers which usually serve 24/7 during the year, reception point, or service points like the railway station, petrol station or small stores (Bosona, 2020). The transporter warehouse tends to be on the outskirts of urban areas, which make it easy for lorry access and this is more capable of being a vital journey for the customer (Paazl, 2020).

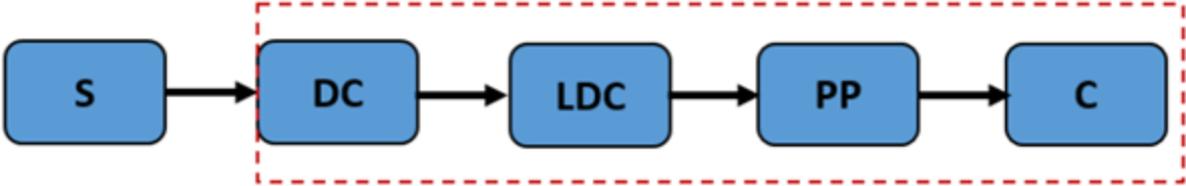


Figure 2. Simplified structure of freight supply chain (Bosona, 2020). Dotted line: Signifies the focus area of freight LML in this study.

Bosona (2020) has expanded the configuration of urban freight LML based on the conceptual scope and definitions stated above and categorized it into three main types, see Figure 3.

In this arrangement:

Type 1: Refers to the distribution center-based delivery (DCs delivery). This type contains two options; option 1: DCs distribute the parcels directly to consumers' homes or PPs, while option 2: The parcels distributed only from the DCs to the PPs where consumers pick up their items.

Type 2: Refers to local distribution center-based delivery (LDC delivery). This type also entails two options. Option 1: DCs distribute parcels to LDCs from where customers pick up their items. Delivery schemes could be used from DC to LDCs. While option 2: DCs carry parcels to LDCs and then the parcels will be distributed to customers' homes or PPs.

Type 3: Refers to the pickup point-based delivery (PP delivery). In this type, the parcels are carried from LDC and stored at the nearest PPs and then picked up by customers.

Based on Figure 3, the parcels can be distributed through different means of vehicles. Bosona (2020) has cleared up the means of transportation that can be used in each type. In type 1, parcels can be distributed by light delivery vehicles, yet the extended travel distance might increase its negative impacts. In type 2 and 3, large trucks could be used and deliver the parcels from DC to LDC. Different means of transport can be used in the two options of type 2. In option 1, customers get their shipment from the LDC even through the passenger vehicles or using their own cars. While in option 2, tiny vehicles and freight bicycles or occasionally a combination between the two, could be utilized to do the home delivery service. In type 3, small freight vehicles and cargo bikes can be used to deliver parcels to PPs. In this case, parcels can be collected from PPs by customers mostly either by walking or using their bikes (Bosona, 2020). The concept of PP-based delivery has been employed by various companies such as Post-24 in Austria, DHL, and SmartPOST in Estonia (Dell Amico & Hadjidimitriou, 2012; Vissar et al., 2014).

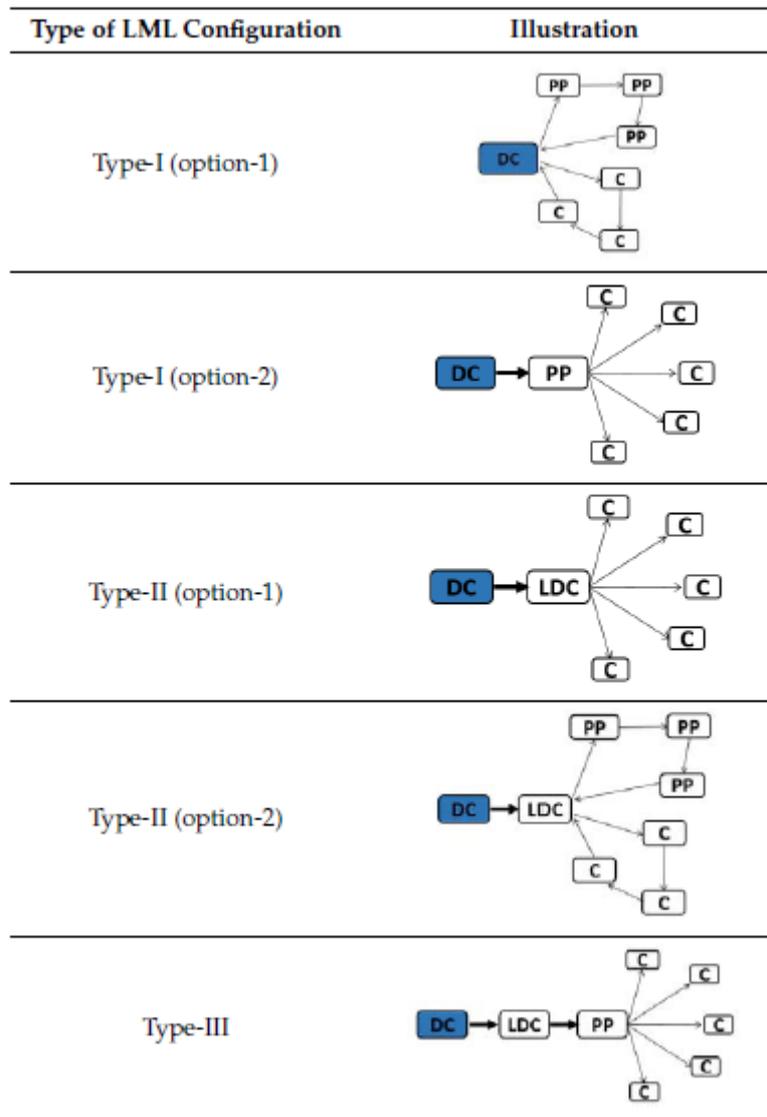


Figure 3. Typology of urban freight LML from logistics configuration point of view (Bosona, 2020).

2.4. How sustainable are different delivery methods?

2.4.1. Standard home delivery

Initially, home delivery service began prior to the rise of the internet and e-commerce when retailers were reacting to the mail orders by serving home delivery for house fitting and substantial electronic goods (Vissar et al., 2014). Currently, rising e-commerce and information technology infrastructure are the factors that contribute to the boost of home delivery services (Iwan et al., 2016). In the LMD service, parcels can be shipped directly to home such as “type 1” and “type 2 (option 2)”, or to PPs such as “type 1(option 1)” and “type 3” which represents

the packages service points in stores, supermarkets, or gas stations (Vissar et al., 2014). However, a significant number of failed deliveries have occurred since it is not always possible for the consumers to be at home (Kedia et al., 2017). When the home delivery fails, it contributes to several issues, not only to the shopper, but also to the shipper. It would increase the cost on the companies as they will spend extra money to redeliver the parcels again in addition to the increase of pollution emissions, traffic congestion and many other concerns (Lachapelle et al., 2018). Since home deliveries will lead to several problems of inefficiency and poor flexibility (Van duin et al., 2016), collection and delivery point (CDP) is suggested as an alternative process to home delivery that is more effective and flexible for corporations and consumers in the last mile delivery service (Oliveira et al., 2019).

2.4.2. Pick up point.

The collection and delivery point (CDP), pick up points or service points is one kind of dissociating point that has recently received a lot of discussions as an alternative to home delivery and a significant opportunity to eliminate the unsuccessful deliveries in urban areas. The customers usually decide the CDP due to their perceived convenience, for instance (work, nearby home, or the way from work to home...). The CDPs could be located in the supermarkets, gas stations, drugstores, malls or post offices... When the CDPs are located in accessible places, it will promote a sustainable urban freight transport by the consolidation of items in an effective journey and the use of sustainable urban mobility such as the non-motorized modes (Oliveira et al., 2019).

As an alternative solution to home delivery, CDP might lessen the home delivery failure (Kedia et al., 2017) as well as eliminating the transport charges on stakeholders, the number of shipping as the multiple delivery could be consolidated in a single point, the number of journeys and thereby, traffic congestion and fuel emissions (Allen et al., 2018). In the same manner, Kedia et al., (2017) asserted that CDP might lessen the vehicles kilometer travel (VKT) if the parcels are collected by the way of customers to another place, or when walking instead of using motorized trips and at the same time, courier companies or retailers could utilize an economic of scale for cargo shipping to CDPs as the deliveries will not be distributed to every client's home.

However, it was argued by Arnold et al. (2017) that customers might use motorized vehicles to collect their orders which results in fuel emissions like home delivery and additional

traffic. Another claim for CDP is that accessibility for clients is the major factor that influences the take up for them (Weltevreden, 2008). Hence, Oliveira et al., (2019) asserted that in order for the system to be more efficient and sustainable, accessibility for consumers needs to be maximized through the locations of CDPs.

When cargo bikes and light cargo vehicles are used in the delivery schemes, this might lessen its associated impacts and travel distance, yet there is a possibility of delivery failure. The last mile logistics configuration in figure 3. might be valuable for the understanding and improvement of home delivery services. For instance, type 2 (option 2) and type 3 in the LML formation could be more sustainable if it is managed and planned in a proper way. City residents who live near to the PPs are most likely using more sustainable means of transport like cycling, walking, or taking a bus (Paazl, 2020). On the other hand, clients who live far away from the PPs such as rural areas, might need to drive to pick up their items and so in this situation the more sustainable way will be by having the item delivered to their home (Paazl, 2020).

2.4.3. Pick up at stores.

In certain situations, customers use the pickup at stores method (which is a method where retailers receive the order of the customers online and the customers in turn collect their goods at the retailer store) (Bosona, 2020). Paazl (2020) stated the sustainable benefits of pick up at stores that most often happen in fashion brands, where the returns are made by the customers immediately and there is no need for an additional trip to the physical store to return the items anymore. Paazl (2020) also asserted that the pickup at stores scheme lessens missed deliveries as the shoppers can pick up their goods at their convenience. Vissar et al. (2014) argued that pick up at stores may increase the environmental impact as it entails customer trips to the retail store. On the other hand, Paazl, (2020) contends that depending on what means of transport the customer willing to use when going to the store, will assess how sustainable the delivery options are picked up at stores.

2.4.4. Same day delivery

Same day delivery is defined as a business model, where the orders of clients are fulfilled on the same day that they are issued (Ulmer, 2017). Same day delivery has the highest carbon footprint compared to the next day delivery (Paazl, 2020). The sustainability concern with same-day delivery is that the retailers will become under pressure due to the little time they have to fill the delivery van to its full capacity whereas in the next day delivery, the shipper

has enough time to work in an efficient way (Paazl, 2020). Some retailers put limits to the location in their same day delivery service. Taking the example of ASOS, this company located in the UK is employing the same day delivery method as the customer who orders before midday can deliver their goods in the evening. However, ASOS have restricted the service to the customers that only live-in specific postcodes in the major urban areas of Birmingham and London keeping the same delivery service near to their warehouses to reduce emissions and miles (ASOS, 2021). Still the fragmentation of order is one of the major issues in the LML (Bosona, 2020). Additional major LML concern related to e-commerce entails the tight delivery window, the extended requirements of customers, and the vast number of small orders (Le Pira et al., 2017). Customers could buy a few quantities of items, yet they want them on time delivery, which results in further carbon emissions and poor load rate (Iwan et al., 2016; Loon et al., 2014). According to variations and assumptions yielded and logistics scheme, the carbon footprint of last mile delivery differs, e.g. it varies from 21 to 650 g CO₂ eq per kg of cargoes (Loon et al., 2014). As long as the item is small, it can be packed efficiently into the delivery van and will fit well through the latter boxes averting missed deliveries (Paazl, 2020). On the contrary, the largest item, the highest carbon footprint due to the inefficient packaging and transportation (Paazl, 2020).

2.4.5. Sustainable delivery

Currently, sustainable delivery is not very pervasive, but some vendors suggest sustainable delivery as an option in their service where they find a highly efficient way of delivering the goods to the final destination. Applying a sustainable delivery option could noticeably extend the delivery time longer than the usual time that customers get used to. Yet, with no time pressure, merchants, and logistic carriers can make sure that their transport van is fully loaded and prepare for the highly efficient delivery method (Aljohani & Thompson, 2020). The sufficient time for retailers allows them to make a precise calculation for the best delivery route to expand the number of transports in one area and subsequently lessen fuel emissions and driving time (Paazl, 2020).

2.5. Sustainable urban freight transport

2.5.1. What is sustainability?

Before defining sustainable urban freight transport, it is important to clarify what the term sustainable development means and what are the main key concepts it contains. Initially,

the term sustainable development earned significance in Brundtland Report, released by the World Commission on Environment and Development, which is also named *Our Common Future*.

Sustainable development is the development that meets the current needs without compromising the capability of forthcoming generations to meet their own needs (Brundtland, 1987). This definition of sustainable development is commonly still utilized these days.

The definition contains two key concepts: The first one refers to the concept of needs, particularly the necessary needs for the poor in the world to which it should be granted an overriding priority; and the idea of restrictions enacted by the state of social organization and technology on the environment's ability to meet the current and forthcoming needs (Brundtland, 1987).

Behrends et al., (2008) stated that this definition underlines three essential factors of sustainable development: (1) economic growth; (2) social equity for meeting the desires of the present generation; environmental safety for the possibility of meeting the desires of the current and forthcoming generation. The authors also asserted that this definition confutes the dispersed view that there are trade-offs with economic prosperity that lead into various impacts on the environment and society (Behrends et al., 2008). According to the EU, the strategy for sustainable development is based on the perception that the social, economic, and environmental impacts of all policies should be assessed in an organized way and considered when making the decision (European Commission, 2001). The natural step, which is the international Non-governmental Organization (NGO), that aids organizations to move strategically for sustainability, explained the prevalent conditions that will be used in a sustainable society by four essentials. These are related as the four system conditions (Holmberg & Robert, 2000), which cover up the three dimensions of sustainable development. "Environmental Protection" is the general dimension that has been identified further by the system conditions explaining the reasons for a non-sustainable environment, such as (1) The concentration in the atmosphere increases due to the substances extracted from the earth's crust; (2) substances generated by society; and (3) the physical ruin of the landscape. (4) is the system condition that covers the economic and social dimension in which the human requirements are met globally (Holmberg & Robert, 2000).

2.5.2. What is sustainable Urban Transport?

There are six sub-objectives of sustainable urban transport defined by (May et al., 2001) which are based on the common principles of sustainable development. These principles contain:

- Safeguard of the environment;
- Equity and social inclusion;
- Liveable roads and neighborhoods;
- Economic competence;
- Safety, and
- Contribution to economic growth.

The European Commission set up an expert working group entailed 20 highly competent stakeholders participating in the planning of urban transport at diverse levels from 12 EU member states (European Commission, 2004). The expert working group has defined a set of specific objectives for a sustainable urban transport system. These objectives involve the following:

- Make sure that all categories of inhabitants and businesses are accessible to what is offered by the transport system in line with the objectives below.
- Lessening the negative impact of the transport system that may affect the citizens in health, security, and safety, specifically the highly vulnerable one.
- Lessening noise emission and air pollution, energy consumption and greenhouse gas emission as well as contributing to meeting legislative requests concerning the environmental noise and air quality.
- Improving the competence and cost-effectiveness of the transportation of goods, considering the external costs.
- Contributing to the boost of the attractiveness and quality of the urban environment.

2.5.3. Impact of Urban Freight Transport

As mentioned earlier, the sustainability aspects are discussed based on the TPL approach. The first research question in this study is focusing mainly on the environmental impacts of urban freight LML. However, the research is aware of some social and economic impacts which are associated with the environmental impact.

Various developments have involved businesses for the sake of optimizing their supply chain such as using information and communication technologies and executing just in time delivery, as well as the alterations in the behavior of customers such as the more diversified and often fluctuating requirements have enhanced the advance of freight transport (OECD, 2003). As mentioned earlier, freight transport plays a crucial role in urban society. In the similar manner, it was argued by Quak that freight transport is the act that urban civilization relies on in order to be sustained (Quak, 2008). Although UFT is significant for urban civilization, it also menaces their habitability. The planet, people, and profit has been negatively influenced by the activities and outcomes of UFT (Quak, 2008) in which the practices of it are not sustainable (Lindholm, 2012).

It was mentioned by Viu-Roig & Alvarez-Palau (2020) that according to the European Science Foundation, the impact of e-commerce last mile logistics was classified and defined as the economic, social, and environmental impacts based on the triple bottom line. Economic impact involves the micro level (sale price of goods, the company's costs and revenues and economic returns), and the macro level (either through productivity growth or economic growth). Social impact involves quality of life, public welfare, behavior, practices and activities of communities and groups. Environmental impact involves managing the environment such as environmental pollution, natural resources and climate and meteorology.

In a similar vein, figure 4. shows the economic, environmental, and social impacts caused by the UFT, based on the sustainability theory "triple bottom line" debated by (Anderson et al., 2005). These impacts are:

Economic impacts which contribute to: Congestion, resource waste and inefficiency.

Environmental impacts which contribute to: Pollutant releases that contain the major greenhouse gas carbon dioxide, utilizing the non-renewable fossil fuel, land, and aggregates,

junk products such as oil, tyres and other items, the loss of wildlife habitats and connected threat to wild sort.

Social impacts which lead to: The physical outcomes of pollutant releases on community health (loss of life, illness, dangers, etc.), the injuries and loss of life causing from traffic collisions, noise, visual intrusion, additional quality of life concerns involving the loss of greenfield locations and open spaces in urban areas as a result of transport infrastructure advancement (Anderson et al., 2005).

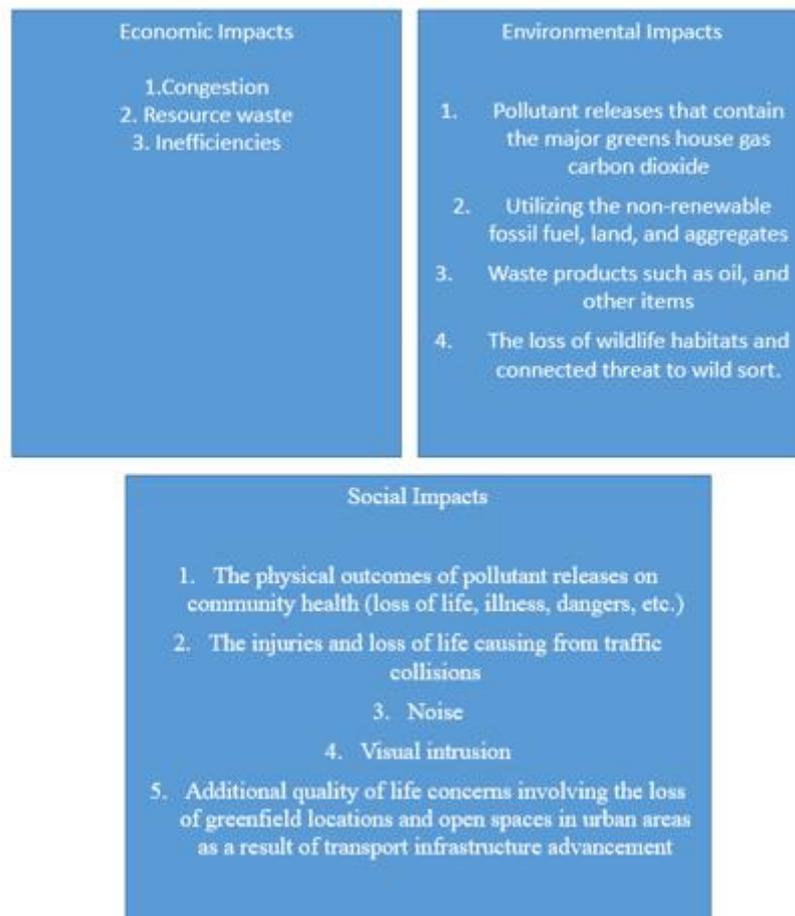


Figure 4. The impact of E-commerce related last mile logistics on cities (Anderson et al., 2005).

In addition to the social and economic impacts, e-commerce is therefore confronting several challenges due to the logistical and operational problems. One of the major problems is related to the fragmentation of orders (Bosona, 2020). Other major issues of e-commerce related urban freight transport is the order of a few quantities of products within a tight delivery time window and the increased number of orders (Pira et al., 2017). Therefore, a poor load rate and

high fuel emissions will be obtained (Iwan et al., 2016). The problems are not only limited to the increase of customers' small order and home delivery practices, as the online shopping will not stop the supplementary shopping by individuals to the physical shops (Bosona, 2020). Further, the transport distance would increase since items could be supplied from any place around the world (Castillo et al., 2018).

Both logistics and urban planning challenges are regarded as being freight LML problems (Ewedairo et al., 2018; Vissar et al., 2014). The three major aspects of urban planning that affect the proficiency of LML involving; the built environment (accompanied with attributes like the intensity of population), planning control (which require a system to deal with the loading, unloading, and parking space concerns), and transport control (which require a system to deal with the limits of speed, bus lanes, traffic light, and railway crossings) (Ewedairo et al., 2018). Therefore, LML activities are influenced by the geographical location and structure of urban areas (Cardenas et al., 2017; Oliveira et al., 2017). Accordingly, it is not easy to alter the existing infrastructure for the cities to accommodate with the expanding freight volume (Sheth et al., 2019). In such cases, using alternative types of vehicles such as electric cargo vehicles could be more efficient. However, this also might depend on the geographical condition of the cities as the use of electric cargo bicycles could be difficult (Oliveira et al., 2017) as the new technology could be inadequate with the road infrastructure and capacity constraints in dimension and weight (Bosona, 2020). Consequently, a high investment cost could be associated with the logistics infrastructure.

2.6 E-commerce and fashion

2.5.4. Fashion e-commerce in relation to last mile logistics

Fashion as an industry and thus online fashion retailing allows customers to have personal preferences, style, and self-expression (Crane & Bovone, 2006). According to the understanding of Choi et al. (2010), individuals can be looking for self-images in fashion brands. This thesis is considering textile and footwear products or accessories (such as jewelry or bags) that are purchased online but does not consider the aesthetical or design value of these (Escobar-Rodríguez & Bonsón-Fernández, 2017). The fashion industry is known for being highly environmentally polluting in several aspects and supply chain is just one of the many. This thesis is focusing on last mile and urban freight deliveries, but the polluting quality of the fashion supply chain is already originating in the fact that the production is moved to low-labour-cost countries, far from consumption. Therefore, the supply chain in the industry is a

key to pursuing sustainability (Caniato et al., 2011) as last mile deliveries are mainly conducted by vans and trucks (Velazquez & Chankov, 2019).

According to Velazquez & Chankov (2019), the problematization of the fashion industry, e-commerce, and the logistical impacts of these is originating in the habit and preference of customers deciding to shop online. Shortly, the convenience of being able to compare items and prices from different brands or retailers at the same time and to get these homes without having to live close to a specific store, and then even being able to return these, creates a high volume of online purchases, thus deliveries. The environmental impact of these is furthermore not only dependent on transportation, but on packaging, warehousing, and other factors.

E-commerce is the service where internet-based transactions connect businesses to private customers. It allows businesses to reach private addresses with deliveries enabling these to become a part of the logistics of the business. This service is the drive behind the revolution in last mile logistics (Viu-Roig & Alvarez-Palau, 2020). Most of the biggest European brands are presented online today (Escobar-Rodríguez & Bonsón-Fernández, 2017), so one has a huge variety of styles, price ranges and clothes for different occasions online.

2.5.5. Customer perceptions on e-commerce and service quality

According to Escobar-Rodríguez & Bonsón-Fernández (2017), online fashion purchases can be based on the following factors: innovativeness, trust and perceived value. Furthermore, cost and time saving are also determined purchases. Some important concepts on customer perceptions in online shopping are discussed under the following titles.

2.6.2.a Perceived risk

Hseih & Tsao (2014) wrote that there are factors that can demotivate people to shop online, such as the risk of not having the physical experience of the product, regarding financial or quality aspects. Customers are of course under the influence of information received from the e-commerce services and this affects their perception. Thus, the simplicity and usefulness of a system will make the customer more accepting of the e-commerce system. Overall due to the risk e-commerce is carrying, consumers can be demanding better quality information on the service. In general, successful e-commerce is based on the quality of systems (usefulness and capabilities), information (assist in decision making and makes it personal about the brand or company) and service. The higher these are, the more willing consumers become to purchase as

the high quality can decrease the perceived risks (Hseih & Tsao, 2014). Li & Huang (2009) explain that the perceived risk is originating from the difference in between the original goal of consumption and the chosen product. The bigger the perceived difference, the higher the risk. This can be broken down to different types (financial, psychological, social, physical, and performance) regarding the experience while using the product. An average purchase placed online can have risks originating from countless different sources, let it be the authorization or trustworthiness of the company, the product or shipping. Payment is most often through online bank surfaces that can suggest for some users the risk of violation of data or privacy.

Büttner & Göritz (2008) researched perceived online trustworthiness and their idea is that trustworthiness can offset perceived risk. Also, the longer the relationship between the e-commerce channel and customer, the higher the dimensionality of trust. Trust in this context is basically the willingness and acceptance of being dependent on another party who is expected to perform an act. According to them, risk is taken in situations where trust is present. Risk is understood as perceived risk by the customer including the relationship and the transaction as well. They proved that the higher the perceived trustworthiness was the higher the intention to purchase online. Zarei et al. (2020) stated that customers can perceive more risk when receiving the product that does not live up to the expectations, the time and energy spent on online shopping turns out to be a waste, and if they do not know from the beginning when their products would arrive.

2.6.2.b Technology Acceptance Model

Technology Acceptance Model (TAM), modelling individual acceptance of technology. The model explains the user behaviour through *perceived usefulness*, meaning technology is found to be beneficial and through *perceived ease of use*, meaning how simply users experience the technology. These are affected by external variables that can influence inner values in customers. TAM helps us to understand user behaviour and approach towards different systems and therefore the perception of e-commerce. Furthermore, these measurements of perception are dependent on the perceived risk by the customer, meaning the higher the perceived risk is the lower the usefulness and ease of use. Also, the higher trust, usefulness and ease of use have positive effects on purchasing and consumption. The final behaviour is also affected and indicated by the level of behavioral intention (Li & Huang, 2009).

2.6.2.c Customer intentions in e-commerce

Chilang & Dholakia (2003) name three most important variables in customer intentions. These are convenience, price, and product characteristics. The quality of convenience can be a main motivator for customers to choose online over offline shopping. This convenience can refer to the physical efforts one has to make or the simplicity of comparing different offers. Hagelberg (2017) also argues that online stores are preferred due to convenience. Davis (1989) mentioned that to understand customer perception in e-commerce, it is crucial to understand the online experience and the perceptions on usefulness. Different e-commerce sites have different qualities when it comes to their design, this will create different perceptions in customers.

2.5.6. Customer perception and intention about sustainable last mile logistics

Under the following titles different concepts, findings and theories are explained on customers' perceptions, attitudes, and intention about sustainability in last mile logistics.

2.6.3.a Last mile delivery in e-commerce

Buldeo Rai et al. (2018) researched if last mile delivery solutions are attractive economically and at the same time sustainable environmentally. Last mile delivery is the logistic solution between the last distribution center and the customer. The article highlights that last mile delivery is interesting, as logistic and sustainability wise this part of the delivery is what differentiates online and offline shopping. Thus, last mile deliveries can both B2B and B2C, but this thesis is focusing on the B2C services. As the last mile delivery has countless final addresses from the same starting point and furthermore retailers are trying to cut the time down for competition, it ends up being a very expensive part of the whole delivery process. (Buldeo Rai et al., 2018)

Last mile has been an increasing trend globally and some of the reasons for that has been the following: globalised world, growth in population, urban areas, and economics furthermore online and omnichannel (purchases both online and offline, such as those purchased online but picked up in physical stores) retailing. As bigger ranges of society, such as both older or younger people, get access and knowledge to use e-commerce, this tendency is growing to continue even more as well as due to e-commerce being available in more platforms, such as applications (Buldeo Rai et al., 2018).

Last mile logistics can be simply presented in the framework of the freight supply chain, where the supplier supplies the distribution center from which the products arrive at the local distribution center. Last mile delivery starts from here and connects to the customer directly or through a pickup point (Bosona, 2020).

2.6.3.b Sustainable last mile and customers

Vakulenko et al. (2019) defined the last mile delivery as a mediator between customer satisfaction and perception of online shopping. Some services that make it more attractive are lower price or faster delivery, tracking and free returns. Last mile delivery as a factor in the customer perception and experience has to be understood to get a holistic understanding. According to Bosona (2020) the last mile is not only the most complex but also the least efficient process amongst the deliveries. Through the examples of EU countries, the article proves that since the last mile is mostly operated with trucks and cars, it has a negative effect on urban development from a sustainability perspective.

The importance of last mile deliveries in customer relations is the fact that it is the final connector between consumers and retailers as well as the often most expensive part of the delivery process (Lim & Matthias, 2019). Thus, last mile being so inefficient, it is a great way for businesses to pursue sustainability through trying to optimise their last mile solutions (Viu-Roig & Alvarez-Palau, 2020). Consequently, if a business has interest in looking as a sustainable and conscious company in front of its customers, through offering sustainable last mile options can be a great way for them as that is exactly the momentum where they are the most connected to their customers (Buldeo Rai et al., 2018; Lim & Matthias, 2019; Vakulenko et al., 2019).

Allen et al. (2018) explains that the reason for the bad vehicle and driving efficiency is originating from the competition in the branch and the low margin these service providers are working with. This is to compete and meet the customer experiences. This problem furthermore created the complexity of the offered delivery time frame, seasonal rushes, customer expectations on delivery times, returns, failed deliveries and logistics centers not being central.

According to Buldeo Rai et al. (2018), there is a paradox and a conflict in that while customers enjoy the comfort of online shopping, they compare it to offline shopping that does not have an absolute price, and thus expect it to be free or nevertheless as cheap as possible. In the past, the suggested solutions for both economic and environmental considerations, are

sustainable vehicles and consideration where the delivery is planned aiming for an effective route or delivery trip, thus it leads to a shorter trip on total/average. This is mainly possible if the delivery is not planned for the same or next day, but the logistical provider has a longer time in planning an efficient route. Another way of consolidation can be picking up points. Since home deliveries often fail if customers are not at home, the several retries of delivering can cause an even higher number of kilometers in the last mile logistics. Parcel deliveries can be a solution to cut down unsuccessful home deliveries and to schedule several deliveries in the same areas. In this case the customer can choose from the offered time frames and thus it suits different lifestyles (Cardenas, 2019). Even more alternative solutions can be offering home delivery but by different vehicles: electric vehicles, cargo bikes or electric bikes. The article highlights that customers will choose the more sustainable option if these are offered and made visible by the retailer as they do have a general interest in considering the environment and minimizing the kilometres (Buldeo Rai et al.,2018).

Yuen et al. (2018) compares home and pick up deliveries and highlights that the latter is more efficient as there are less failed deliveries for the company, furthermore for environmental and urban aspects it means less driving and less parking space used in the cities or less traffic accidents. It also helps customers in not having to stay at home and wait for the delivery. However, according to Cardenas (2019), if individual customers organise their trips by car to the pickup points, it is only more convenient in the aspect of avoiding failed deliveries but it is still a polluting solution.

2.6.3.c Omnichannel retailing, pick up in stores

As discussed in Buldeo Rai et al. (2018) in the so called omnichannel organisation of retail online and offline channels are merged and while the delivery and the logistics have a broader variety of solutions, it also requires more organising and this can be more challenging for the retailer. In omnichannel retailing, the purchases are placed online but are picked up in the retailers' physical stores. While they are able to cut down delivery costs through offering pick up in their stores, they can reach out to a wider crowd through the online channels. Buldeo Rai et al. (2018), found that customers are neutral towards sustainable options and are willing to wait or pick up themselves to avoid paying for the delivery as well as support omnichannel retailing by the willingness of visiting physical locations of the retailer. Omnichannel retailing is environmentally favorable due to less addresses and therefore shorter driving distances.

Furthermore, it is often preferred by customers for being able to handle returns easier, making additional purchases or getting professional support from the staff in the store.

2.6.3.d Customer intentions in last mile

Wang et al. (2018) is focusing on how customers respond to being offered sustainable last mile delivery services, such as pick up points. They highlight the importance of consumer behaviour and intention in last mile services, such as in organising pick up Points, which is a great way to become more cost effective as well. Since last mile deliveries directly interface the customer, they are highly customer oriented and thus based on customer behaviour and on customer expectations and experience making it the process that can be a factor in competitive advantage. Therefore, to understand the success or interest in innovative solutions, customer behaviour has to be understood as it is just as crucial as different business aspects. Furthermore, they name customer logistics, meaning customers can take part in the big scheme of logistical systems through their purchasing decision and through that gain power in company logistics. Despite all the upsides of self-pick up points, they can carry less “excitement” to the customer. The system is simple, clear and has less of a surprise effect. The research is concluding that the consumption of the logistical service can be fun and enjoyable for the customers, thus the decisions can be based on what sounds more exciting to partake in. This is important as according to Hagen & Scheel-Kopeinig (2021), the satisfaction and the online shopping experience is connected by the last mile experience. As an example, Paazl (2020) mentioned that a company called “Picnic driving” set routes at set times. By doing this, they can choose the shortest ways and avoid failed deliveries, since customers always know for sure when the delivery will arrive.

E-commerce allows customers not to have to travel and carry the products themselves. They like the comfort of easily making a decision while having options without limits, let these be limits in variety, time or location of the products. Convenience is proven to be the most important in the factors customers perceive. It highlights that deliveries to home addresses can seem like convenient options even if in the end they will be inconvenienced due to failed deliveries and having to wait at home. Also pick up points come off as easily accessible even if they are missing the experience of receiving “customer service” as a home delivery would do (Zarei et al., 2020).

The thesis has no possibility to present differences compared to offline shopping but as Paazl (2020) mentioned that in some aspects, online shopping can be less polluting due to the

fact that there are no individual trips to the stores. Paazl (2020) has also mentioned that consumers are willing to choose the most sustainable method even if it takes longer, but they are often unaware of the polluting effects of fast deliveries. At the same time, if the retailer highlights the fact that the offered delivery method is green, it will be effective enough that many customers choose it.

2.6.3.e Sustainable consumption

Sustainable use of last mile deliveries by customers is understood in the framework of general sustainable consumption. According to Fuchs & Boll (2018), it is rooted in consumption patterns of the consumer society, and these patterns have to answer basic consumption needs for good life quality, without exploiting natural resources by toxic materials, pollution or waste throughout the life cycle of the consumed product, thus, not to compromise for the next generations.

2.6. Theoretical framework

Based on the reviewed literature a framework was gathered on fashion e-commerce and some important concepts on customer perceptions in e-commerce, such as perceived risk and TAM, as well as customer perceptions on last mile deliveries. These will help to understand and analyze the survey questions that are aiming to map the respondents' approach towards fashion e-commerce as well as provide a general understanding on online shopping. The literature review also provides a collection of the current academic understanding on customer perceptions on sustainable last mile delivery. This research is going to answer the following research question: *“Are the customer's interest and perception correlated with the use of sustainable last mile delivery in fashion e-commerce in Sweden?”*. The collected and processed literature allows us to present a conceptual framework and base two hypotheses on these, as presented later. The research question is going to be answered by the analyzed research results with an understanding on the literature review. The research was conducted in the form of an online survey, as explained under the Methodology chapter. This quantitative survey is looking to understand customers' opinion on the last mile deliveries of their fashion goods. Analyzing the results, the research will be able to prove or reject the hypotheses made based on the literature.

The research gap in this research is found in the controversy between the highly polluting fashion industry's last mile delivery practices, and the general interest and raising

attention, both by consumers and corporations, in sustainability both in the fashion and last mile delivery industry (Buldeo Rai et al., 2018) (Shen et al., 2014). This gap is not found to have been much discussed in academia and to understand the controversy a research is required. It is therefore important to address customer perceptions to understand this gap so the key question on customer perception being correlated to the use of sustainable last mile delivery can be answered. The research helps to understand if there is an interest in sustainable deliveries and if so, is this interest satisfied in practice. The research gap was also chosen based on the difference in knowledge between what was read in the literature and what the research is interested in discovering. In the literature reviewed it is presented what last mile delivery services are considered more sustainable and how customers perceive these solutions. The research's interest is not only in customer behavior regarding these solutions, but also if customers in Sweden have an interest in sustainable deliveries regardless of retailers' practices.

The understanding of environmental sustainability and the sustainable aspects of urban last mile deliveries are defined in the literature review. The research is approaching the topic of sustainability as the main quality of last mile delivery services instead of, for example, understanding sustainability as an indirect result on society. Different aspects of the last mile delivery industry on society and economics are mentioned, but these have a secondary importance after the environmental sustainability understanding.

Last mile logistics is the final part of the logistics process which leads to the final customers or recipients (Bányai, 2018; Velazquez & Chankov, 2019). Being the direct point of connection to customers it is a source of competitive advantage and consequently to business success (Wang et al., 2018). It has been becoming a popular topic in different academic contexts during the last few years and understanding customer intentions and perceptions is empowering for customers (Wang et al., 2018) and thus, can affect last mile delivery services. This is both due to the business effect of the changing markets and also due to the rising interest in sustainability. This is since online shopping and e-commerce is becoming more and more popular and normal in private customers' consumption. Today one can get anything from anywhere in the world delivered to their home and any chosen location close to that. At the same time, it is not always the most cost effective model for most of the businesses due to the complicated deliveries (Buldeo Rai et al., 2018). Even items that would have been hard to imagine a few years ago to be purchased online are now available in webshops, such as furniture or fashion. These are products that not only are nice to touch and see in real life but also to try on (Barclays, 2014; Tiwapat et al., 2018). Still today, we can find countless brands online

offering countless styles one can be looking for and different sites and retailers offering many brands as well. As discussed in the literature review the reason for this can be being able to compare more products at the same time than offline, being able to return unwanted products for free or very cheap and lastly saving the time and energy visiting offline stores (Velazquez and Chankov 2019). This thesis has no possibility to discuss the pollution of the fashion industry in different aspects, but as logistics is one of them, it is aiming to see if there are sustainable methods that are applied. Last mile is furthermore interesting in an e-commerce understanding as it differentiates online shopping from offline (Buldeo Rai et al., 2018).

Concrete examples of environmentally sustainable last mile solutions are pick up points and deliveries with longer timeframes. There are different ways of organising the online purchase not to be delivered to the customers doorstep but to be picked up from somewhere by them. In this case the trucks, or other vehicles, have to drive less from the last warehouse, which is crucially important in an urban context. Furthermore, the customer and the courier will not miss each other, leading to even more complications (Buldeo Rai et al., 2018; Wang et al., 2018; Yuen et al., 2018). As Paazl (2020) shows that same day deliveries have a noticeable higher effect on the environment than next day deliveries, if these deliveries are to the customers door, the logistical companies have more time to organise and deliver the orders to the same areas in the same rounds and therefore can cut down the time and distance driven. According to Bosona (2020), the last mile delivery industry can be evaluated in the different aspects of how much the vehicles are loaded, distance and time spent on the road, routes, time frames, costs, energy, emissions, and these direct and indirect impacts. Smaller electric vehicles, such as bicycles are also more sustainable as they use less of the urban surface for parking, are not noisy and have lower emissions. Furthermore, the article as a solution suggests merging urban last mile with urban planning, where institutes of public infrastructure, such as roads or public transportation, would be organised to use for a more efficient last mile service system (Bosona, 2020).

According to Buldeo Rai et al. (2018), customers have an interest in keeping the prices of shipping of online purchases low, meaning that they will not pay for fast deliveries if not necessary. They can perceive deliveries to pick up points to be more convenient as they do not have to wait for couriers at home.

Customer perception is crucially important in a last mile context for the whole consumer experience, since in e-commerce it is the last mile delivery that connects retailer and consumer

in time and place and thus highly affects consumer satisfaction. When shopping online, customers perceive the experience in the aspects of usefulness, ease of use and perceived risk. Risk is perceived if the original idea of consumption will possibly be different from the purchased product. Perceived usefulness is expressing how much the e-commerce surfaces are perceived to be beneficial and perceived ease of use expressing how simple it is to navigate and consume on them. These concepts are from the Technology Acceptance Model, which is a broader concept modelling individual use of technology (Li & Huang, 2009).

There are no services that can offer a perfect customer experience in all aspects and shopping online often means taking risks in customer decisions due to having less information on the product (Li & Huang, 2009). Thus, customers often have to make sacrifices in different scenarios for the sake of convenience (Hagelberg, 2017). The latter implies that using e-commerce customers have to sacrifice the experience of trying on or touching and seeing clothes in real life. Furthermore, to get access to products that are available for them online, they will have to sacrifice not receiving the product for free, as in visiting a physical store, but having to pay for delivery (Buldeo Rai et al., 2018). Also, customers can receive a lower service quality by not receiving assistance in the shops, having to wait for an order to arrive or having to pay a higher price for the product, for the delivery or for both (Zarei et al., 2020).

When it comes to making sacrifices about sustainability interests, the research understands sacrifice as something that is affecting the convenience of online shopping. In the literature review, convenience is shown to be the main perception in e-commerce purchases (Buldeo Rai et al., 2018; Hagelberg, 2017; Oliveira et al., 2019; Chilang & Dholakia, 2003; Velazquez & Chankov, 2019). Thus, for those that a convenient delivery is received at their home addresses or received fastly after purchasing sacrifices must be made about sustainability, as these are the less sustainable options (Yuen et al. 2018; Cardenas, 2019; Buldeo Rai et al. 2018; Wang et al. 2018).

Based on the literature the following hypotheses are formed:

Hypothesis 1:

Customers have an interest in sustainability and would like to sacrifice and live up to the sustainable standards in the last mile delivery service (time, price, service quality, delivery methods) when reminded and if possible.

Hypothesis 2:

Customers have no direct interest in choosing sustainable last mile delivery options (time, price, service quality, and delivery methods), unless these options are convenient, and suit their priorities.

The second hypothesis' idea is that the sustainable options have to be either cheaper, faster or both than the less sustainable options to be able to compete with them.

A structural model is created to examine the impact of customer perception on the sustainable last mile delivery, represented by the conceptual scope, see Figure 5. As illustrated, the first hypothesis is based on customer perception in sustainability and possibly sacrifices, while the second is based on the perceived convenience.

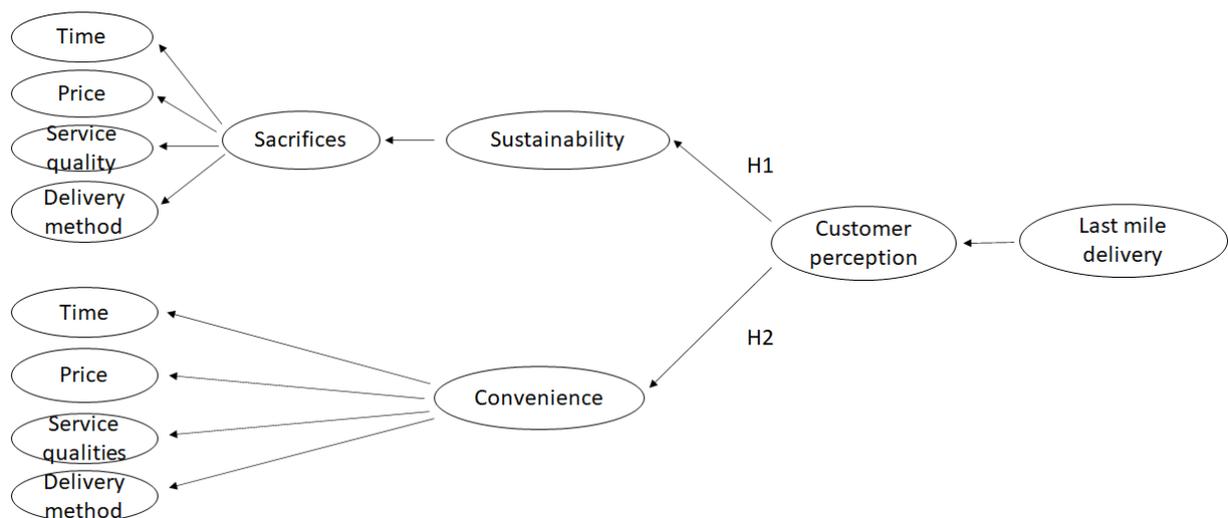


Figure 5. Theoretical framework of customer perception related-last mile delivery. Source: Author's own illustration.

The first research question, “How does the last mile freight logistics impact the environmental sustainability aspect in urban areas?” is not a part of the theoretical framework as no research was conducted to answer it, but it helps in building a conceptual framework and a strong base of understanding of different concepts and definitions, such as sustainability or last mile delivery.

3. Methodology

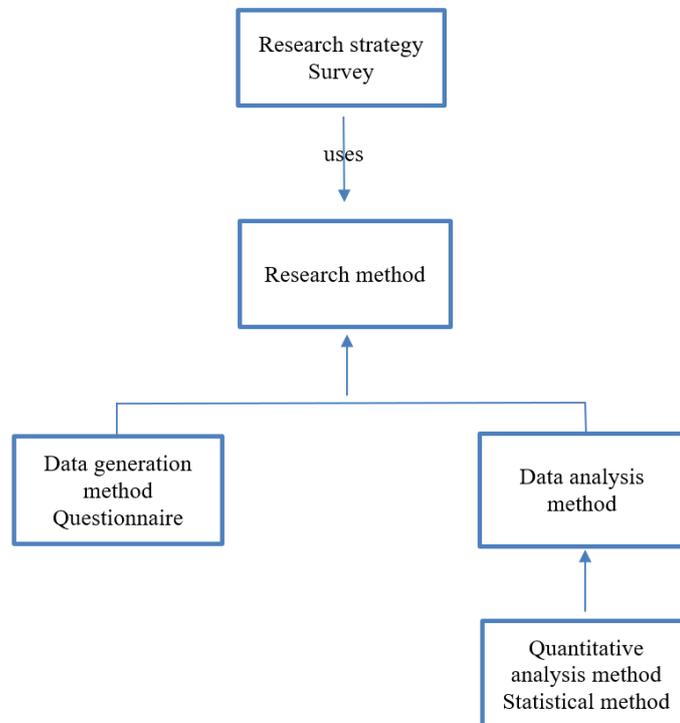


Figure 6. Research Strategies and Research Methods. Author's own illustration.

3.1. Research approach

The research of this thesis looks at the outside world with an objectivist understanding, in other words it accepts the fact that the world of e-commerce, the concept of sustainability and customers' interests in the segment of those two exist and that they are facts externally from the research (Bryman, 2012).

This thesis is answering two research questions and the first one is answered exclusively based on the reviewed literature. As this question is aiming to present an answer that has already been discovered by other researchers, the choice on a literature review method was made. As this thesis is written in the field of Social Sciences it has no means, knowledge, or resources to make measurements or calculations on the fields of Urbanization or Nature Sciences. Instead,

the research question is answered with the help of already published academic knowledge, using peer reviewed articles available at Lund University's library and on Google Scholar.

The second research question is answered by a survey which is based on the literature review, that allows us to form hypotheses that the research is aiming to answer. Not only that the research is based on already existing academic literature, but it was also decided to choose a topic that has been popular both in academia but also as a public topic. At the same time, the research meets the theory of positivism, meaning it is open for other solutions and understandings than this is already known through the applied literature (Bryman, 2012).

The research is following a deductive method by being based on facts and knowledge already available academically. The research has identified points that can be empirically researched and can be explained by collected data by testing and accepting/refusing the hypotheses (Bryman, 2012). This deductive method helps to identify the research gap and possibly describe it through the results of the research. The research is also following descriptive statistics which are applied to summaries and describe a set of data and also inferential statistics that allows to draw conclusions from a smaller group to a larger one (May, 2011; Bryman, 2021).

The literature review provides the framework to last mile logistics, sustainability, urban freight transport, e-commerce in fashion and customer perceptions both on e-commerce and on sustainable last mile deliveries. This summarization of academic literature helped to see and form ideas that the hypotheses are formed on. These are customers' consideration and the form of interest in sustainable last mile deliveries. By this the thesis is aiming to contribute to understanding the individual customers' perspective on mainly big corporation's logistical solutions.

In the literature review the aim is to choose articles and books that address how private customers perceive sustainable last mile delivery solutions and see how these results are formulated and augmented by other researchers. The research is focusing on fashion e-commerce to have an understanding on a group of products that are both popular to purchase online and offline and are also consumed by a wide range of demographic groups. The concepts highlighted in the theoretical framework help to guideline the research both by their definitions and with the scope they are providing. By measuring customer perception, it is possible to find fine differences between different answers, thus to consistently connect the

research with other researches, and to see relationships between different concepts (Bryman, 2012).

3.2. Research strategy and design

Having a research strategy enables the research to focus and plan the methodology. In many cases different methods could work for different reasons, having a research strategy can help to motivate and understand the decisions and choices regarding the chosen methods (Denscombe, 2010). The strategy in conducting the research is based on the research approach described previously. As the hypotheses are interested in a big group of private consumers' understanding, on a scale, the most convenient way to measure this is by a survey. Like this it is possible to efficiently collect the answers of a bigger group of people, while making sure that every respondent is receiving the same questions and options as answers since the survey is standardized, by asking the same exact questions. With surveys, attitudes and behavior can be easily formed with the help of measures and these can be quantified with categorization (May, 2011). The survey is using different ordinal and nominal variables and thus it is easy to analyze it with statistical software. It was advantageous to use surveys as it is efficient, respondents can choose when to answer them and it is easy to spread them online with the Google Form link. It is important that the survey can be easily shared to a large group of people so that it will reach those who meet the requirements of being in the population, that means purchasing fashion items online in Sweden. Also, a survey enabled the possibility to include an open question where respondents could answer with free text, this being almost as in a qualitative method, the research could collect extra input and thoughts of the respondents' interest and perception, but these are hardly comparable to one other.

The research also decided to follow the quantitative method as it is aiming to quantify and understand direct experiences of customers regarding sustainable last mile deliveries (Bryman, 2012). The research is looking to understand what the interest and perception of customers is and not why their attitude is like that, therefore quantitative methods are more suitable. Also, the researchers' identity, beliefs and background have no effect on the research, only the collected numerical data is interesting (Denscombe, 2010; Barnham, 2015). Even though that experience could possibly be better expressed through interviews and thus a qualitative method, the research decided to follow the quantitative and survey methods to be able to quantify it easily. Furthermore, experiences' differences and their sources are secondary in this research.

The design of the research is cross sectional, as it is collecting the data of several cases around the same point of time and is using several quantitative variables. This is a common way to design surveys, since it is collecting responses from a variation of the whole sample, and by quantifying the data the research can be consistent.

3.3. Case selection

The research was decided to be focused on fashion e-commerce. This decision was partly based on the convenience of collecting data in the research. In general purchasing fashion online is highly popular amongst young people both online and offline (Morgan & Birtwistle, 2019). Especially in Scandinavia, fashion is dominant on an economic, cultural and on the level of individual expression as well (Melchior, 2011). This implied the idea that data collection would be easy to conduct as it would be easy to find respondents who are members of the research population and in general have an interest and understanding about the fashion industry. The case selection was also based on the fact that fashion is known to be highly environmentally polluting in many aspects (Caniato et al., 2011), so researching the sustainability aspects of different parts of the fashion supply chain can be academically interesting and important.

3.4. Data sampling

Sweden is a country with a generally high degree of digitalization (OECD, 2018) where many people shop online (Nordea, 2021). The research was decided to focus on Sweden; thus, the population is Swedish e-commerce customers. The sample is a random sample of Swedish customers. The survey was public online so anyone in the population could reach it, given that they are active online, which is corresponding to the quality of an e-commerce consumer.

For identifying the sample, it is necessary to identify the whole population of the research. This consists of Swedish e-commerce consumers of different online fashion retailers purchasing on at least a monthly basis. As the size of this population would be bigger than what is available with the resources of this research a non-probability sample group was created. The sampling frame was different social media groups (Facebook) and academic platforms (Canvas). The surveys on social media were posted in public groups, but all groups are related to or are aiming to gather Facebook users in Sweden. The academic platform of Canvas and its users are more understandable to the researchers, since there, the survey was sent to the researchers' colleagues from previous courses. Overall, both framing systems allowed the

researchers to collect answers efficiently and conveniently during the time that was provided for the research. Of course, this means that most of the respondents are either university students, which is a relatively small and not very representative group of the whole population and that the responses collected through Facebook are customers who would be active on social media, and obviously not all fashion e-commerce customers are that.

3.5. Data collection

The survey was published using a Google Form document and posted on the above-mentioned platforms, between March and April 2021 and at the end the survey was closed to receive new answers. The survey received 113 answers and none of these were invalid due to the fact that the questions in the survey were compulsory other than one open question. Not only that the questions were compulsory to answer, amongst the demographic questions the respondents were asked to specify where in Sweden they live, to make sure that all respondents are based in Sweden. The research was aiming to be transparent and not too long so respondents would happily finish answering all questions. The survey was designed with an understanding that all questions play a role and have a connection with the research question. The survey also starts with a short introduction about the research, researchers and informing the respondents that by answering their consent taking part in the research.

The questionnaire is starting with collecting demographic data, continued by questions on online fashion purchases. The general questions on preferred delivery method and interest in sustainability are followed, so that the following answers on attitude in sustainable last mile delivery can be measured in correlation with these. The next section is mapping the most important factors for the customers in the last mile delivery. The factors that had to be rated were sustainability, price, time, and delivery company. The last questions of the survey are focusing on the approach to sustainable last mile delivery and the sustainability of fashion retailers.

3.6. Data analysis

The data was entered in the SPSS software and analyzed in a way so that the results can answer the research question. The data collected in our survey is of nominal and ordinal nature. Therefore, the following bivariate tests were applied: Chi Square, Cross tabulation, Phi test, and Spearman's correlation and also univariate tests to, for example, understand the demography of the respondents (May, 2011).

To study the correlation between two ordinal scales and answer the research question, the Spearman's Correlation test was used, as there was no ratio/interval data used in our survey. Most of the questions used in the survey allowed the answers to be represented in a form of Likert scale, where respondents' strength of attitude is measured on an ordinal scale. Spearman's Correlation test uses rankings of data rather than absolute values of the variables. Therefore, the Spearman's Correlation is the suitable test that should be used to obtain the correlation between the two variables (Bryman, 2012).

3.7. Research quality

Research quality is mostly measured through reliability and validity. The difference between those two is that reliability shows if the measure of the concept is consistent whereas validity shows whether an indicator is really measuring a concept that research believes it does. Overall, it can be explained that validity presumes reliability and that through these qualities the research is repeatable and standardized (May, 2011). In the case of a cross sectional research design the measurements' reliability depends on if the measurements are designed correctly. External validity is strong if the research is based on a randomly selected sample whereas internal validity is weak due to the fact that the cross-sectional design is mostly suggesting associations (Bryman, 2012).

Reliability of the research is due to the fact that the measurements were carefully designed based on the collected knowledge from the literature, and the answers in the questionnaire were correct and relevant as all compulsory questions that needed to be measured to prove the hypotheses were closed questions. The validity was measured by the Spearman coefficient, which can be seen on (Tables 3-7).

3.8. Ethical consideration

Firstly and most importantly all answers were anonymous and it was not possible for the researchers to identify the respondents due to the nature of Google Forms and also the nature of the questions. As mentioned in the research design paragraph, the survey starts with informing the respondents that by answering and submitting the answers on the questions they consent to take part in the research, this can be found in the Appendix A. The collected data is only accessible to the researchers and protected with a password, furthermore it is not analyzed for other purposes than academic and is not going to be stored longer after research and the

thesis is approved by the university. No personal information was collected, and all participants answered the questionnaire voluntarily.

3.9. Limitations

Surveys' respondents are sometimes not careful in how and what they answer and that they might have a different interpretation of some questions as the researchers do. Also, respondents have a tendency to answer differently from how they actually think or act (May, 2011).

Another limitation of the research results' can be that it is focusing on the fashion industry and fashion retailers are not the only popular e-commerce retailers. By the choice of this case the research cannot present answers on overall perceptions on last mile delivery. Other consumer populations could also have important attitudes towards last mile deliveries, not only on the customers of the fashion industry, but these are not measured.

A big majority of respondents were from Skåne (see Figure 11) and as the respondents were not evenly spread out throughout the country it would be hard to draw conclusions about the whole of Sweden. The results apply though for Skåne.

The last limitation is that the survey was lacking variables with ratio scales, thus no Pearson correlation and ANOVA calculations could be made. Instead, Likert scales were used. This scale is great to illustrate and rank attitudes with, which works well when measuring perception and interest (May, 2011). This was conducted in the research by offering statements where the respondents had to choose to what extent they agree or are interested (Bryman, 2012).

4. Results and Data Analysis

4.1. Results

In this chapter, the results from the data collection and analysis are presented. Surveys were distributed online, and the results were produced using the SPSS software. The data entered in SPSS can be found under Appendix B. For the survey presented in this study, 113 completed questionnaires were received. Out of 113 respondents, the majority represents females in which their proportion is around 71% whereas the approximate male proportion is 25% as shown in Figure 7. This study illustrates that females are more interested in buying fashion online than males.

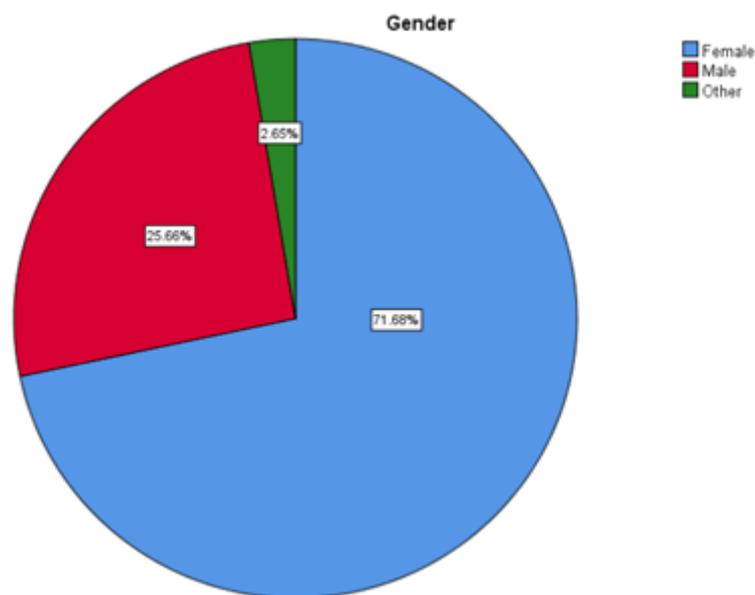


Figure 7. Distribution of gender among the respondents.

The pie chart in figure 8. shows a clear visualization of the age ranges of respondents who completed the survey. 97% of the participants were in the age group between (21-50) years old whereas the age group 20 and younger and the mature group 51 years and above represent only around 3% from the whole participants. However, the vast majority is from the younger group (21-30).

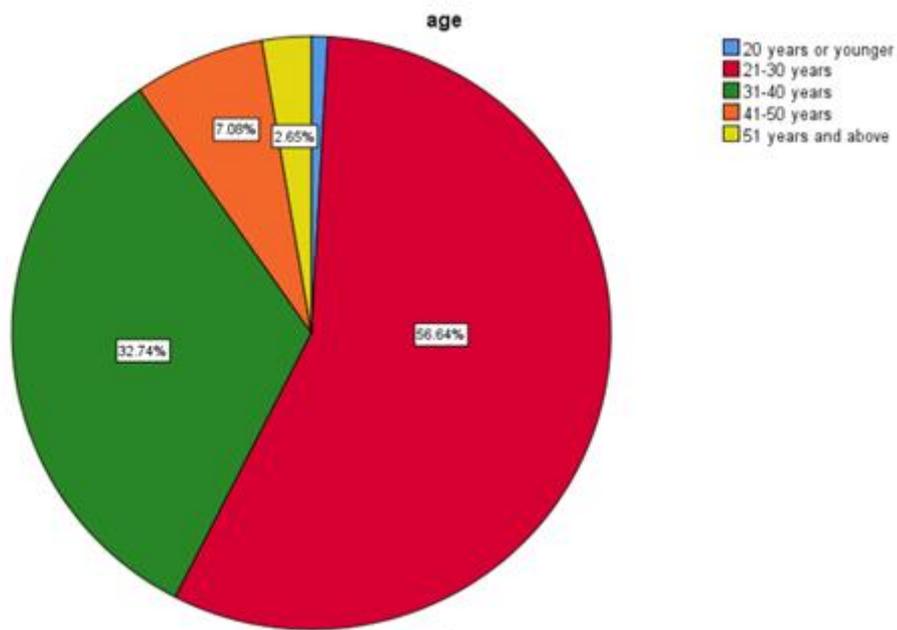


Figure 8. Distribution of the age of respondents.

Figure 9. indicates that around 88% of the survey respondents buy fashion online. The remaining 12% have answered with no but answered the survey completely. The reason why the research still considered their answers is because it is assumed that they buy items online but not fashion as they continued answering the full questionnaire.

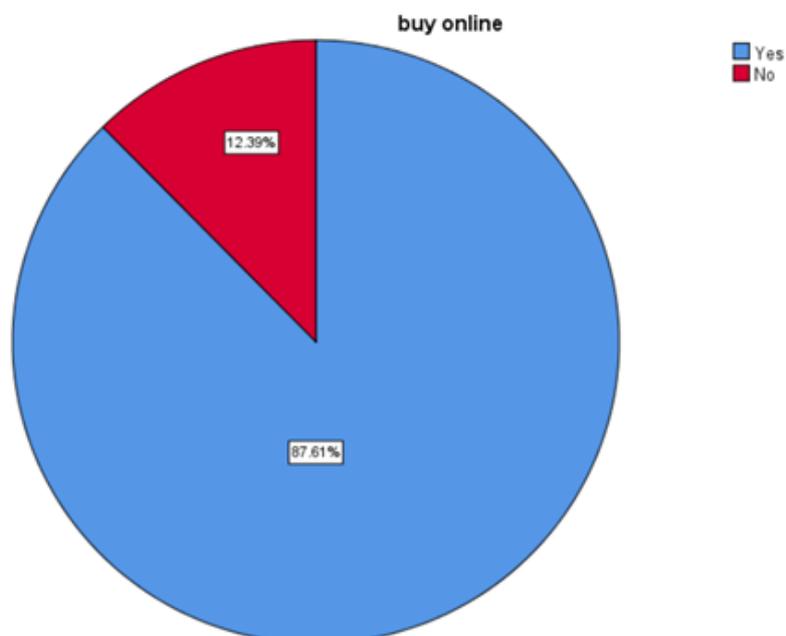


Figure 9. Distribution of respondents who buy fashion online.

In terms of purchasing fashion online, Figure 10. indicates the major proportion in which around 59% purchase fashion items once per month. Whereas around 29% of the respondents do not purchase fashion items on a monthly basis. Beneath this case, and due to the lower proportions indicated for the other options (2 to 3 times a month and 4 to 5 times a month), it is assumed that respondents who answered zero, are buying online only several times on a yearly basis.

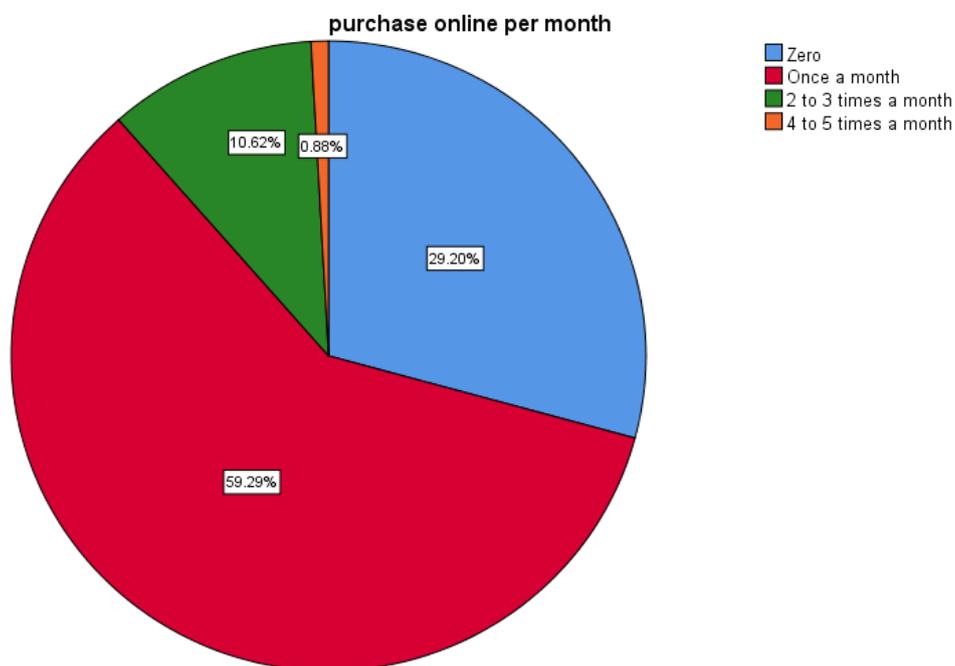


Figure 10. Distribution of respondents who purchase online per month.

Figure 11. identifies the sampling method which indicates that the respondents that participate in this study, are mostly living in Malmö (39%), Helsingborg (24%) and Lund (14%). Due to disparities of sampling between geographical locations, the results cannot be generalized to the whole of Sweden. Therefore, as the sample is mostly distributed in Skåne, the result would not be the same for those who are living in Stockholm, Uppsala, or other cities in Sweden.

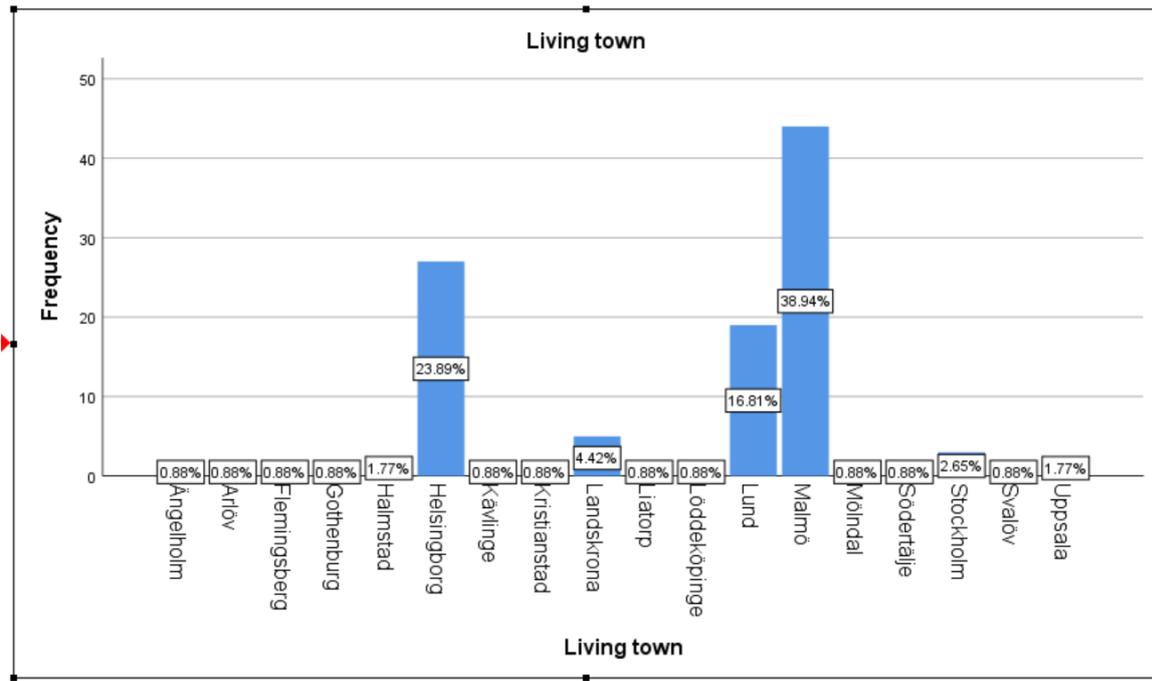


Figure 11. Distribution of the respondents according to towns.

Figure 12. below displays that most of the respondents who purchase fashion online in Sweden chose the delivery method of “Pick up at collection point” in which the approximate proportion indicates 57%. Whereas the other two delivery methods indicate around 20% for “Pick up at stores” and 23% for “Home delivery”.



Figure 12. Distribution of the respondents according to the frequency of choosing different delivery methods.

Under the statements on considering purchasing sustainable services in general in Figure 13. below, the majority of respondents buy green services. The phrase “green services” was used as a synonym for “sustainable services” in the survey. “When they are available and if the price is reasonable” represents around 63% whereas only around 9% buy green services “When they are available even if the price is high”.

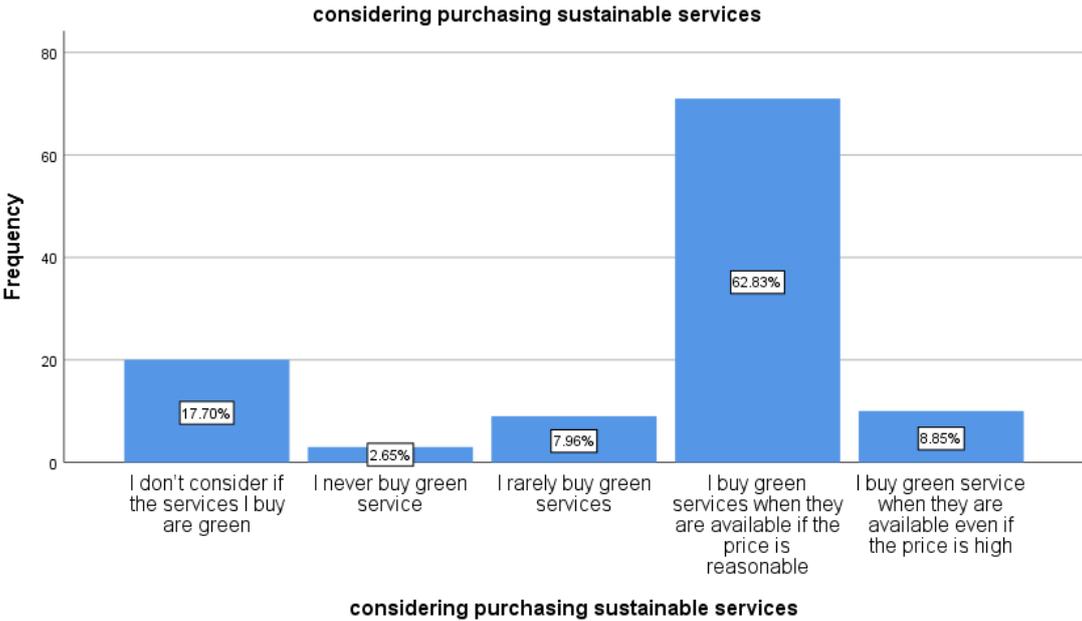


Figure 13. Distribution of respondents according to the frequency of considering buying sustainable services.

Figure 14. below shows that around 63% of people claim they sacrifice some aspects in the last mile delivery service such as low price, high speed delivery, high service quality most often to be sustainable, where around 27% are not sure if they sacrifice or not.

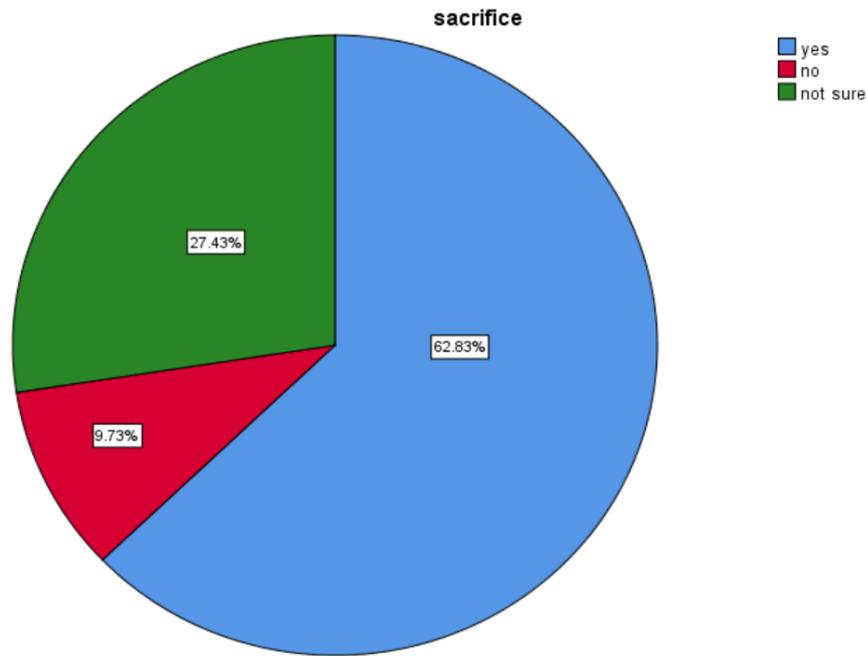


Figure 14. Distribution of respondents who they have to sacrifice aspects in service quality to be sustainable.

Figure 15. shows that most respondents around 68% might change their purchasing habits when ordering online if the company offered more sustainable delivery options, whereas the smallest proportion of respondents, around 5% says no and around 26% are not sure about this decision.

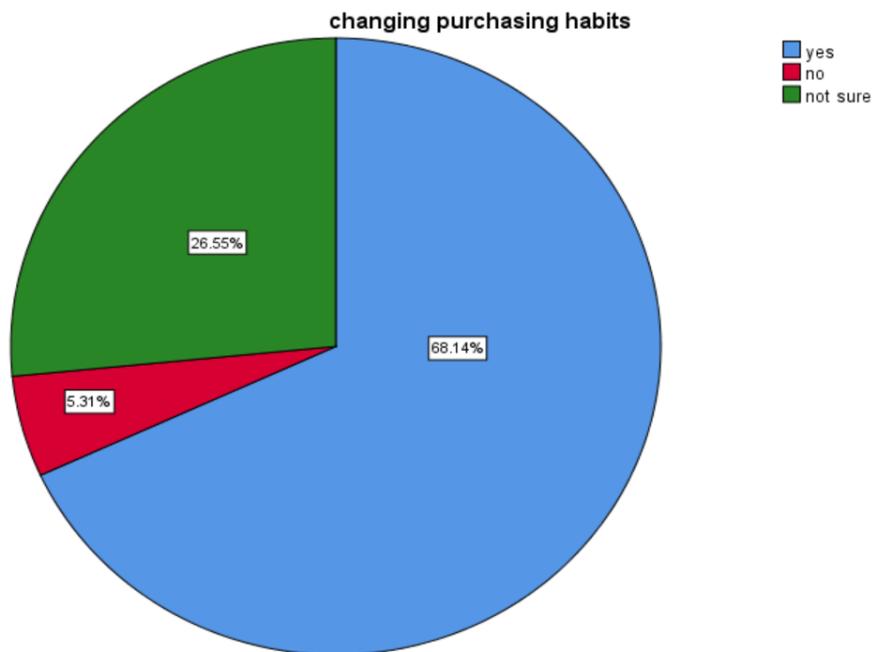


Figure 15. Distribution of respondents who might change their purchasing habits if the company offered more sustainable delivery options.

Figure 16. shows that the majority of respondents around 97% believe that retailers should take responsibility and act on sustainability whereas the smallest proportion around 3% says no.

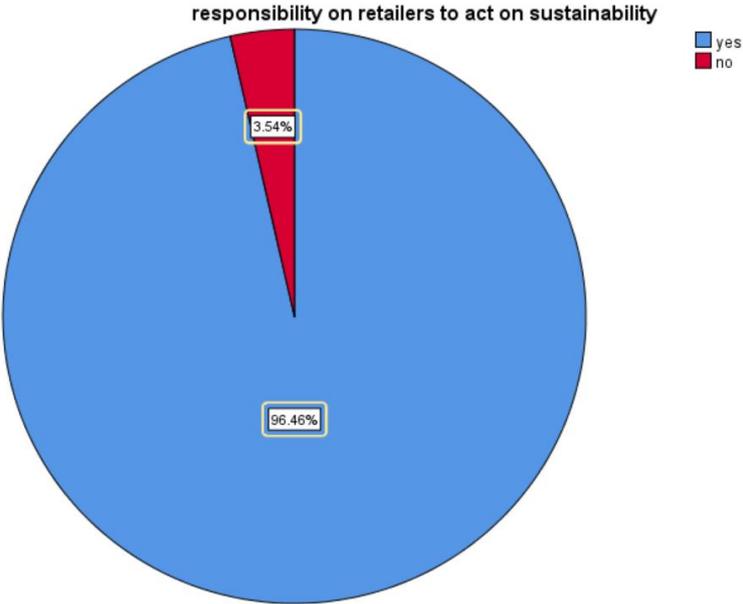


Figure 16. Distribution of respondents who believe that retailers should take responsibility to act on sustainability.

Figure 17. shows that the majority of respondents do not trust the distributor's claims which represent around 47% whereas only around 29% do trust them.

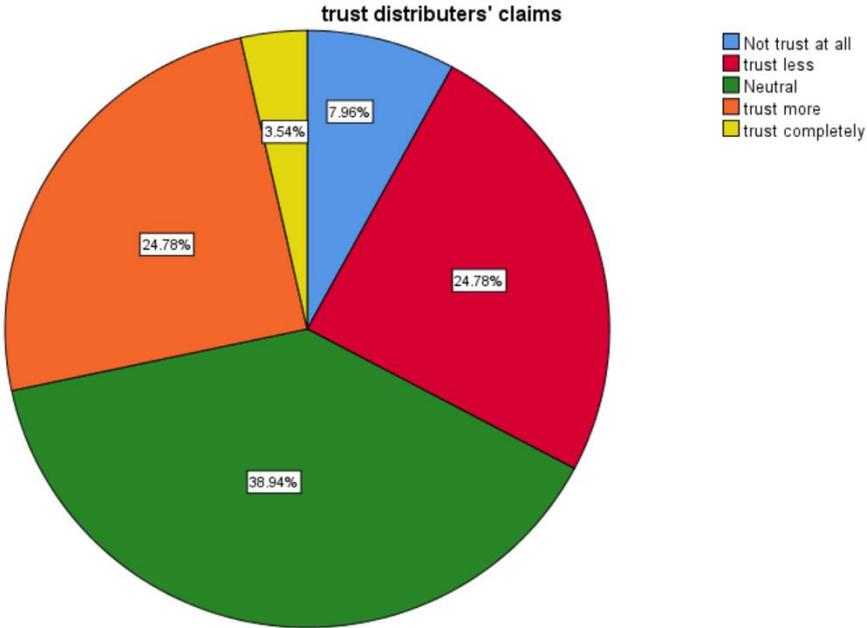


Figure 17. Level of trust of respondents towards the distributors' claims about sustainable service.

The case processing summary in Table 1. is indicating the level of distribution of the customers' perception in the multiple variables.

-In terms of caring about sustainability, the majority of respondents represent around 49% caring more and a lot about sustainability, whereas around 28% care less and not at all.

-In terms of price, around 73% of respondents care about the low price of the delivery service whereas only around 11.5% do not mind about the low price.

-In terms of time, around 53% care about the fast delivery of their purchasing order, whereas only around 22% do not mind it.

Case Processing Summary

		N	Marginal Percentage
care about sustainability	Not at all	16	14.2%
	less	16	14.2%
	neutral	32	28.3%
	more	32	28.3%
	a lot	17	15.0%
low price matter	Not at all	3	2.7%
	less	10	8.8%
	neutral	17	15.0%
	more	35	31.0%
	a lot	48	42.5%
fast delivery	not at all	7	6.2%
	less	18	15.9%
	neutral	28	24.8%
	more	25	22.1%
	a lot	35	31.0%
Valid		113	100.0%
Missing		0	
Total		113	

Table 1. Case processing summary

The case processing summary below shows the level of distributions of two distinct variables, see Table 2.

-In terms of service quality, around 50% are caring more about having a sustainable delivery service whereas only around 20% care less and not at all.

-In terms of the company that delivers, around 39% are caring about the company that delivers whereas around 41% caring less and not at all.

Case Processing Summary

		N	Marginal Percentage
sustainable delivery	not at all	9	8.0%
	less	13	11.5%
	neutral	35	31.0%
	more	37	32.7%
	a lot	19	16.8%
company that delivers	not at all	27	23.9%
	less	19	16.8%
	neutral	23	20.4%
	more	28	24.8%
	a lot	16	14.2%
Valid		113	100.0%
Missing		0	
Total		113	

Table 2. Case processing summary 2

The Spearman's test on Table 3. below shows no significant correlation between caring about sustainability and fast delivery as the level of significance is $0.254 > 0.05$. The coefficient correlation has negative direction and shows a weak correlation as it is equal to (-0.108) . Thus, it can be assumed that people who care about sustainability, do not mind the slow delivery.

➔ Nonparametric Correlations

			care about sustainability	fast delivery
Spearman's rho	care about sustainability	Correlation Coefficient	1.000	-.108
		Sig. (2-tailed)	.	.254
		N	113	113
	fast delivery	Correlation Coefficient	-.108	1.000
		Sig. (2-tailed)	.254	.
		N	113	113

Table 3. Spearman's Correlation between caring about sustainability and fast delivery.

Spearman Correlation is shown on Table 4. between two Likert-scales (ordinal variables) which entails how much the customers care about sustainability and price in the last mile delivery service. Table 4. below shows a significant correlation as the level of significance is $0.000 < 0.05$. The correlation coefficient between the two variables has a negative direction and shows a weak correlation as it is equal to (-0.375). This means that customers who care about sustainability, do not care about the low price. In other words, those who have an interest in sustainability, do not have an interest in having low last mile delivery prices.

Nonparametric Correlations

			care about sustainability	low price matter
Spearman's rho	care about sustainability	Correlation Coefficient	1.000	-.375**
		Sig. (2-tailed)	.	.000
		N	113	113
	low price matter	Correlation Coefficient	-.375**	1.000
		Sig. (2-tailed)	.000	.
		N	113	113

** . Correlation is significant at the 0.01 level (2-tailed).

Table 4. Spearman's Correlation between caring about sustainability and price.

The Spearman's test on Table 5. below shows a significant correlation between caring about sustainability and service quality in sustainable delivery as the level of significance is $0.000 < 0.05$. The coefficient correlation has a positive direction and shows a strong correlation as it is equal to (0.810). Therefore, as the caring about sustainability increases, customers will buy more sustainable delivery services.

➔ Nonparametric Correlations

			care about sustainability	sustainable delivery
Spearman's rho	care about sustainability	Correlation Coefficient	1.000	.810**
		Sig. (2-tailed)	.	.000
		N	113	113
	sustainable delivery	Correlation Coefficient	.810**	1.000
		Sig. (2-tailed)	.000	.
		N	113	113

** . Correlation is significant at the 0.01 level (2-tailed).

Table 5. Spearman's Correlation between caring about sustainability and sustainable service quality.

The Spearman's test on Table 6. shows a significant correlation between caring about sustainability and the company that delivers as the level of significance is $0.025 < 0.05$. The correlation coefficient has a positive direction and shows a weak correlation as it is equal to 0.211. Thus, the more the customers are caring about sustainability, the more the company that delivers matters to them to see if this company delivers sustainable service or not.

➔ Nonparametric Correlations

			care about sustainability	company that delivers
Spearman's rho	care about sustainability	Correlation Coefficient	1.000	.211*
		Sig. (2-tailed)	.	.025
		N	113	113
	company that delivers	Correlation Coefficient	.211*	1.000
		Sig. (2-tailed)	.025	.
		N	113	113

*. Correlation is significant at the 0.05 level (2-tailed).

Table 6. Spearman's Correlation between caring about sustainability and the company that delivers.

The Spearman's test on Table 7. below shows a significant correlation between caring about sustainability and considering purchasing sustainable services. The coefficient correlation between the two variables has a positive direction and shows a moderate correlation as it is equal to (0.529). Thus, as caring about sustainability increases, considering purchasing sustainable services by customers also increases.

➔ Nonparametric Correlations

			care about sustainability	considering purchasing sustainable services
Spearman's rho	care about sustainability	Correlation Coefficient	1.000	.529**
		Sig. (2-tailed)	.	.000
		N	113	113
	considering purchasing sustainable services	Correlation Coefficient	.529**	1.000
		Sig. (2-tailed)	.000	.
		N	113	113

** . Correlation is significant at the 0.01 level (2-tailed).

Table 7. Spearman's Correlation between caring about sustainability and considering purchasing sustainable services.

4.2. Data Analysis

4.2.1. Customers' attitudes towards sustainability

In this study, most of the respondents were female (72%), and from the younger age group between 21-30 years which represents around 56%. Around 88% of the respondents buy fashion online. However, their number of purchases per month is low as most of them (59%) buy once per month. Those respondents are living mostly in Skåne (Malmö 29%, Lund 14%, and Helsingborg 24%).

The results in this study illustrate that females are more interested in buying fashion online than males and most specifically the younger age group. Few answers were given by respondents who do not buy fashion online, but their answers are considered as the research assumed they buy items online but not fashion as they continued answering the full questionnaire. Further, the research assumed that respondents who do not buy fashion once per month and the low number of purchases per month are customers who buy only on a yearly basis which is an option that is missed in the survey and deemed a limitation. The major distribution of respondents around Skåne only cannot be generalized for the whole of Sweden due to the disparities among answers through geographical locations.

The results have shown that consumers' perspective is correlated with the use of sustainable last mile delivery service. Hypotheses (H1) and (H2) were supported and the second research question was answered using Spearman's correlation in SPSS. The research question is answered through measuring several aspects that customers usually consider in the delivery service when purchasing online in relation to sustainability. The studied aspects involve the time (fast delivery), price (low), service quality (sustainable delivery), and delivery method. These aspects have been constructed through a conceptual framework which has been used in this study, see Figure 5.

The Spearman's test shows that there is no significant correlation between fast delivery and caring about sustainability. The negative direction of the coefficient correlation allows the researchers to assume that the respondents that care about sustainability, do not mind the slow delivery. Based on the previous literature, same day delivery is considered mostly inefficient due to the little time that an employee has to fill the van as well as having a high footprint compared to the next day delivery (Paazl, 2020). The descriptive analysis shows that most frequently the survey respondents are caring a lot about the fast delivery which indicates around

31% and only around 6% do not care at all. This means that the customers in Sweden are caring about the speed of delivery regardless of the sustainable issues that could occur.

In terms of price, the results show that a significant correlation occurs considering the low price and caring about sustainability. The correlation coefficient shows that the relation is weak and has a negative direction (-0.375). The negative direction between these two variables indicates that people who care about sustainability, do not prioritize the low price. Although the coefficient correlation indicates the strength and weakness of this association, as well as its positive and negative direction, the correlation between these two variables exists. Delivery method is measured using a descriptive analysis as its level of measurement is categorical. The descriptive analysis of this variable would be analyzed based on the previous literature used in this research paper. Additional variables related to customer perceptions have been measured using Spearman's test to inspect if they are associated with the level of caring about sustainability. These variables involve “the company that delivers” and “considers purchasing sustainable services”. In the early literature, it was argued that customers' interest is further willingness to get a low-price delivery service when ordering online (Buldeo Rai et al., 2018). In the same manner, this study shows that the survey respondents are mostly having interest in obtaining a low-price delivery service (73%), which means that when it comes to price, they choose their convenience and what suits their priorities.

The descriptive analysis related delivery method shows that most survey respondents (57%) are picking up their deliveries at a collection point. Based on the literature, pick up at collection point is considered the alternative to home delivery and the more flexible and convenient method for the buyers and courier companies mostly when it is accessible for consumers (Oliveira et al., 2019). Therefore, customers would mostly prefer to choose the pickup at collection point as a delivery method since it suits their convenience and prevents home delivery failure as they are not always able to be at home. However, “Pick up at collection point” would be more sustainable if it is located near the consumers home and when the customers use a sustainable means of transport like walking and cycling (Paazl, 2020). Therefore, consumers need to be more careful in choosing the nearby place whenever it is possible to pick up their orders and try to use a sustainable means of transport instead of motor vehicles.

In the case of service quality, results show that a significant correlation exists between having a sustainable delivery and caring about sustainability. The correlation coefficient

indicates a positive direction between the two variables (0.810) and implies that people who care about sustainability, obtain more sustainable delivery service. Low quality service is perceived by consumers when waiting much time for the order to arrive and when paying high prices for the delivery service (Buldeo Rai et al., 2018). Results show that survey's respondents opt to have more sustainable service quality in their deliveries (50%). Further, the major answer of the respondents (49%) is that they care about sustainability in their delivery service.

4.2.2. Summarizing the data analysis

Summarizing the results, people mostly choose their convenience in the asserted aspects when purchasing online such as the (price, speed delivery and delivery method) and opt to have a sustainable service quality while believing that they are caring about sustainability in their deliveries. This can be denoted for hypotheses H1 and H2 in which people occasionally believe that they are sacrificing and opting for a sustainable delivery service; however, at the same time, they prioritize their convenience in certain aspects when purchasing online.

According to the analyzed results, the customers choose more convenience and more suitable options for their delivery service goal such as fast delivery, low price, high service quality and a flexible delivery method, "Pick up at collection point". Correspondingly, H2 is highly supported in this study. In this sense, it is essential when consumers have sustainable behaviors when choosing certain aspects and take action to choose more sustainable delivery services.

From this concept, it can be assumed that most of the respondents might lack the knowledge of what aspects made the delivery service more sustainable. In other words, people are not aware enough about what makes the service more sustainable and what options they should choose to purchase more sustainable. Therefore, things need to be clearer and more transparent and reach the customer easily by providing further information and details about the sustainable options offered and make the service more sustainable (e.g. how much carbon will be emitted for the delivery) during the purchase process.

Two additional aspects related customer perspective have been tested by the Spearman's Correlation which entails "the company that delivers" and "considering purchasing sustainable aspects" in relation with the variable of "caring about sustainability". The results show a strong significance correlation and a positive direction between caring about sustainability and the company that delivers. Also, a significant correlation and positive direction exists between the

customer perception in considering purchasing sustainable services and caring about sustainability. These two outcomes mean that people who care about sustainability, would care about the company that delivers and would consider purchasing sustainable services. Through the descriptive frequencies, results show that the majority of respondents around (41%) do not care around the company that delivers or cares less. Further, around (63%) of those respondents buy green services when they are available if the price is reasonable. On the other hand, the major proportion of respondents which represents around 47% says that they do not trust distributors' claims about sustainability. Additionally, around 63% believe that they have to sacrifice certain aspects such as (price, time and service quality) when purchasing fashion online. Also, around 68% of the respondents might change their purchasing habits and become more sustainable. It can be assumed that the untrust of most respondents is related to some sort of suspicion of “green washing” of some business. Green washing is when consumers are deceived for false impressions and unsubstantiated claims that make them believe that the company's services are environmentally friendly (Nguyen et al., 2019).

It was noticed from the finding that a large proportion of respondents, which represents around 97%, believe that retailers should take responsibility to act on sustainability. Corresponding to the stated results, it can be assumed that most consumers who live in Sweden and purchase fashion online, expect retailers and courier companies to be transparent about their activities and operations. This was noticeable due the conflict in the results where customers would prefer sustainable deliveries, but it appears as if they cannot afford it or simply do not get offered. Therefore, adding transparency at the core of the company value or service offerings, generating more consciousness and involvement for consumers with the issues.

4.2.3. Suggestions to improve the delivery service

The last question in the survey was an open question and asked for respondents to see if they have suggestions in their mind for retailers to improve the last mile delivery service. More than half of the respondents are not having any suggestions, and some other respondents' answers were not related to the delivery service. However, few answers were interesting and added to this research some inspirations. Such answers were about the legislation, as it needs to be stricter and obligate the companies to act sustainably and be environmentally friendly. Such respondents do not trust the retailer's claim about sustainability as it might be just a greenwashing. Other customers consider that improving the delivery service is part of how they are socialized as customers. Those customers have no problem with paying more for the

sustainable delivery service. But it has to be “baked” into the retail price of the goods, rather than an “extra cost”. They believe that it should be automatic in that way and this will help customers not having to reflect and have a choice. Thus, as the market is regulated, sustainable goods are the only option to purchase by consumers. This could be rather referred to the socialist perspective which calls for the public rather than the private possession or control for own properties (Ball & Richard, 2021).

Further, it was also suggested that in order for the process to be really sustainable, changes must be enacted from the root. A better system of delivery also implies better conditions for delivery workers and companies will certainly need to invest more money in which it is not just the responsibility of the customer. Additionally, the tendency of respondents was towards the company to offer some motivations that encourage customers to purchase sustainable services. For instance, offering consumers some credit from the sustainable delivery that can be used when purchasing and getting some discounts. As stated earlier in the analysis, respondents also suggest retailers being more transparent towards offering a sustainable service in which it can reach the customers in a nice and clear way. In other words, respondents would like to see some numbers and more information when trying to choose between different options, such as how much of these options contribute to sustainability. For example: carbon footprint for every option. Also, to make sure that the buyer does understand the benefits of using the last mile delivery and what they can gain from using their service. This might encourage the customer to be aware and choose the more sustainable delivery service. Some have pointed out retailers should look into the packaging materials; having less paper packaging materials and using smaller boxes if possible, so they take up less space in the delivery process.

Additionally, respondents proposed getting little or no paperwork with the final delivery, most of which can be sent via email. Further tendencies were towards having the sustainable options of the delivery service at an accessible price and offering more choices to the courier service such as the mode of transport, delivery time in relation to sustainability. They do also prefer the convenient options of having a high quality, low price, and fast delivery besides correcting the sustainable delivery service. They believe that if these options are afforded by retailers in the delivery service to the consumer, it will effectively promote sustainability. From this perspective, and according to the tendency of what has been studied in this research, it is clearly obvious that consumers choose what suits their intentions and would select the sustainable options if it is compatible with what they prefer. It can also be seen from the survey results that most respondents do not understand sustainable service and unsustainable

services as they recommend retailers to provide more guidance. Consumers expect more information from retailers about what makes the service more sustainable and get more encouragement from retailers to be aware and choose the most sustainable options. Simultaneously, if the choice is between sustainability and price, most would choose price. Therefore, to promote the sustainable last mile delivery, this would be a major problem for retailers as it will require them much effort and cost to make consumers pleased and distinguish their service in the market.

5. Discussion

This chapter is serving the purpose of discussing the research results in the framework of the whole study and also to provide answers on Research Question 1 and 2 and to motivate these. The chapter is discussing the Research Questions and Results in relation to the whole literature review and conceptual and theoretical framework.

This thesis is aiming to answer the following two research questions:

RQ1: How does the last mile freight logistics impact the environmental sustainability aspect in urban areas?

RQ2: Are the customer's interest and perception correlated with the use of sustainable last mile delivery in fashion e-commerce in Sweden?

For a general understanding a literature review is developed around last mile delivery definitions, relating concepts, and introduces the new challenges.

The first research question was answered purely based on this literature review, this is done through applying the stated definitions and exploring the sustainability level of different solutions. The conclusions from this literature review are as follows. Last mile logistics allows urban citizens to get access to products from all around the world, but by doing that it affects the urban infrastructure, life, and environment. As urbanization and last mile service are growing, last mile makes urban growth unsustainable due to the fact that freight transport is mostly based on roads. The understanding of last mile typology helps to conclude that the front-end processes of last mile logistics are in the focus of urban sustainability aspects. Thus, the final process, last mile delivery, is the process through which urban environments' sustainability can be destroyed or achieved. Another important factor in last mile services is the strategic situation of the DC, this is where the goods arrive, just outside the city, and from where the last mile deliveries to the customers will leave. This leads to the conclusion that position and accessibility of the DCs has an impact on what type of vehicles will perform the last mile delivery and thus on urban sustainability. Another major factor in urban sustainability is the method of last mile delivery. Pick up points are those collection services that are most commonly located in supermarkets or other public sites, in the form of a service desk or a self-service machine. By delivering to pick up points, instead of private addresses, from the DCs on the same trip several packages can be delivered. This, for the first, shortens the route driven and

means there will be no unsuccessful deliveries due to wrong delivery information or customers who cannot be found at home. The latter is also creating longer delivery routes with the couriers having to return to the same address's multiple times. As found in the literature the customers' own transportation method to the pickup points can further affect the sustainability of this service. Pick up points are efficient in a sustainability understanding if the customers reach them by walking, cycling or public transportation and also organize the trip with other necessary trips to the same area. Pick up points are the furthest from sustainable if customers travel by car and only for the sake of the parcel, meaning it is not organized together with other trips. As the research has an urban understanding, it is supposed that customers will usually not have to drive long distances by car.

An interesting way of organizing e-commerce by brands is omnichannel retailing, also mentioned as "pick up at stores" before. This is the solution when the placed order is picked up in the offline store of the brand. The main advantage of this method is that no extra trip has to be made by the customer to a pickup point or any other postal service in case there are items that need to be returned. If the customer does not wish to keep the purchased items, they can just simply leave it at the store. Just like in the case of pick up points this method is way more sustainable than home deliveries as there will be no unsuccessful deliveries. Again, as explained above the sustainability of this delivery method is also affected by the customers' choice of transportation method. Trips organized together with trips of other purposes on public transport, bicycles or by walk are more sustainable than those by car with no other purpose.

As it can be implied from the described results above, the least sustainable method is deliveries to home addresses. Customers would often choose receiving a parcel at a given address, let this be their work or home address. The last mile delivery is conducted to several addresses, causing longer driving distances and higher emissions as well as more failed deliveries. In some cases, customers would order their parcels to receive them the same or next day. This leads to the need where the trips of the delivery vehicle are not organized according to the most effective route, including as many delivery addresses as possible on the same route, but instead, they have to prioritize the addresses that are supposed to receive the parcels first. This again, leads to inefficiency, longer routes, and higher emissions. A more favorable way of home deliveries in a sustainability aspect is when the retailer and the logistical provider have several workdays to organize and conduct the delivery.

There are different alternative sustainable ways of transport, such as those on vehicles that have emissions majorly different from trucks, such as bicycles, electric bicycles or electric

cars. It is common in them that they create less noise pollution. Bicycles do not use the parking space nor create traffic and electric cars do not create emission directly in the cities.

Overall, to answer the research question, last mile freight logistics impact urban areas through the vehicles used and the routes driven by these. This applies both for the routes driven by couriers and by customers when they drive to pick up points or stores. These drives have direct emissions and thus negative effects in the urban areas. Furthermore, last mile logistics has an impact on urban areas by the traffic caused by the last mile vehicles. Other than the traffic, the vehicles also cause accidents in urban areas, use parking areas, and create noise pollution. These aspects are important in sustainable urbanization and safe cities and currently last mile logistics create a negative effect.

The second research question's hypotheses were also based on the literature, but this question was answered through the conducted research. The collected literature helped to hypothesize that customers' intentions in sustainable orders and these hypotheses are as follows.

The aim of the study is to answer the second research question, thus, to investigate a correlation between customers' perspectives on sustainability and sustainable last mile delivery. This is based on a theoretical framework created based on the literature review, considering the aspects of delivery time, price, and service quality. The objective of the research is to find out whether customers living in Sweden have an interest in sustainable deliveries.

The following hypotheses were made:

Hypothesis 1:

Customers have an interest in sustainability and would like to sacrifice and live up to the sustainable standards in the last mile delivery service (time, price, service quality, delivery methods) when reminded and if possible.

Hypothesis 2:

Customers have no direct interest in choosing sustainable last mile delivery options (time, price, service quality, and delivery methods), unless these options are convenient, and suit their priorities.

The results show that around 70 % of the respondents would purchase fashion online at least once a month. This result allows the analysis to be used and applied to answer the research question as it provides that the answers on the following survey questions are relevant. However, as the majority of the respondents are located in Skåne the research is only providing an understanding on consumers' interest and perception in this part of Sweden and not the whole country.

As the results were discussed among the analysis of the survey results, it is also presented that these respondents mainly use "Pick up at collection points". As discussed throughout the literature review and Research Question 1, this is often the most sustainable delivery method. This practice of the respondents supports the other findings, namely that customers do have an interest in sustainable delivery methods and choose these when available. The respondents were also asked about their approach in general to sustainability and sustainable services other than deliveries. These results in the study show that the majority does have an interest in sustainable consumption that helps the research to believe that the other responses on sustainable deliveries are valid as well.

Through the SPSS tests the hypotheses were supported and the research question could be answered with this result. The conclusions were made through measuring whether customers who claim to care about sustainability would mind receiving the parcels with a slower method. The results show that these customers interested in sustainability are not keen on fast deliveries. At the same time, answers show an interest in fast deliveries. These findings support Hypothesis (1).

It was further shown that customers are mostly interested in keeping delivery prices low. Also, most respondents would order their parcels to pick up points, which was shown to be a more sustainable delivery method, thus customers are using a sustainable option. This is supposedly due to the cheaper prices of pick-up point deliveries. These findings are supporting Hypothesis (2). The research can also see a connection between the results regarding preferred low delivery prices and the presented concept of Perceived Risk. When shopping online, customers can perceive the experience risky, for example whether the parcel will arrive and in

what condition. This could be though affected by, as explained in the Technology Accepted Model, retailers if the e-commerce sites offered higher perceived usefulness and perceived ease of use and through that minimize the perceived risks.

However, even if the answer would usually show a common interest both in sustainability and sustainable deliveries, customers still perceive faster deliveries of higher quality. A conclusion based on the research results was made regarding customers' lacking knowledge and understanding on factors that make deliveries sustainable, as contradiction is found about caring about fast delivery and sustainability at the same time. Considering the claims on trusting distributors' communication on sustainability it can be concluded that around 30% would listen and learn (trust more and trust completely) if communicated more about sustainability, 40% would not listen to it and the rest (not trust at all + trust less) would refuse the claims as they do not trust distributors (see Figure 17). In the research's understanding this corresponds with the results, where the majority of respondents claimed that retailers should take responsibility for sustainability (see Figure 16.).

The relevant answers from the open survey question were supporting the same idea of retailers acting on sustainability as well as retailers communicating about the environmental effects of their deliveries.

To answer Research Question 2, it can be said the customer interest and perception are indeed correlated with the use of sustainable last mile delivery in Sweden. As the accepted Hypotheses show there are customer interest and perception in sustainability that are practiced whenever it is perceived possible by the customer or whenever customers are reminded by the retailers. The results overall allow the conclusion that customers in general have the kind of attitude and expectations that shift towards the use of sustainable practices. They are willing to wait longer or pay more for sustainable deliveries which correspond to the possibilities of sustainable last mile deliveries currently in fashion e-commerce. Furthermore, there is a willingness to change their purchasing habits towards making more sustainable decisions (see Figure 15).

6. Conclusions

Throughout the last decade and the pandemic, the e-commerce field has been growing rapidly, resulting in the growth of last mile deliveries. The study to this end examined last mile logistics' impact in sustainability aspects in urban areas and customer perception and interest in the sustainability aspect of last mile. The aim and objective of the research study on investigating customer perspectives and finding out whether there is an interest in sustainable deliveries was successfully fulfilled and the results are applied to answer Research Question 2.

To conclude the answers to Research Question 1 and Research Question 2, it can be said that urban areas are impacted by the last mile logistics through the vehicles used, the distances driven, the pollution and the traffic created. Since customers were shown to have an interest and perception about the sustainability of last mile deliveries, which is practiced whenever perceived possible, they supposedly perceive the negative impacts as shown in the results of Research Question 1. It can be concluded that by designing and offering more sustainable solutions, both urban sustainability and customer interests in sustainability can be satisfied.

6.1. Research Limitations

The field of study was limited in this research as fashion was the only item that was mentioned in the survey. Thus, the distribution of gender and age might differ if there were more possible items to buy online such as electronics or others. This also was obvious as some respondents around 13% replied that they do not buy fashion online, hence continued the survey. The answers of those respondents are considered as the authors assumed that those respondents buy items online but perhaps not fashion.

Further, according to the pandemic situation (Covid 19), the distribution of the survey was limited to the only use of online platforms and restricted the area of study as the results appeared to be concentrated in Skåne only. The reason is because the survey has been distributed online on social media such as the Facebook groups and Canvas. These groups were mostly related to communities around Skåne, where the research was conducted, and led to disparities of survey respondents in the location distribution among Sweden. Due to this disparity, the result of sample distribution is limited to Skåne and cannot be analyzed and regarded to all the cities in Sweden. This means that research cannot claim what interests people

living in Stockholm have in sustainable last mile delivery. Therefore, the result cannot be generalized to the whole of Sweden.

Moreover, the study shows some frequency data related to age and gender, however no similarities or differences have been made using these two variables as it would not be relevant findings that might fulfil the purpose of this paper. The research study is investigating the correlation between customer perception and the use of sustainable last mile delivery to find out if the survey respondents care about sustainable delivery service when purchasing online.

Lastly, the survey did not allow respondents to choose an option of purchasing fashion online less often than once a month, but not never. The only question about the frequency of purchases was phrased as “How often do you usually purchase fashion items online per month?”. So those who would purchase items several times throughout the year, but not every month might have had difficulty answering.

6.2. Future research

The suggestion for future research of this thesis is to further discuss the concept of sustainability in an urban and last mile logistics understanding to identify more factors and possibilities regarding the pollution created and ways to avoid that. Additionally, not only retailers and distributors should communicate about the sustainability aspect of their e-commerce activities, but also more awareness programs need to be created by governments, the public sector, and environmental NGOs to spread the knowledge among people about concerns related to unsustainable delivery service. This identified lack of knowledge can also be related to the research gap, which was the general interest of the public in sustainability and the conflicting practices of last mile usage. Furthermore, this research was based on respondents who were mostly based in Skåne, female and are from mainly a younger age group so a research with wider demography could offer better understanding on the topic.

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Appendix A – The Survey

The role of customer perception on sustainable last mile delivery in Sweden

Dear participants,

You are invited to participate in our research about the impact of customer perception on the sustainable delivery service in e-commerce fashion. This study is being conducted by Hoda Nseif and Kinga Danesch from the department of Service Management at Lund University. The purpose of this study is to find out if the customer's interest in the service quality in e-commerce affects the sustainable last mile delivery .

By submitting this digital survey, you give your consent to participate in the study. Note that your response will be only used in our research and treated totally anonymously. Your involvement in this study is purely voluntary. The survey takes about 5 minutes to complete. We appreciate your participation.

Hoda Nseif and Kinga Danesch Candidates

Department of Service Management, Lund University

Gender

- Male
- Female
- Other

What is your age?

- 20 years or younger
- 21-30 years
- 31-40 years
- 41-50 years
- 51 years and above

In which town do you live in Sweden?

own answer

Do you buy fashion online? (ex. Clothing, shoes, bags, accessories, etc...)

- Yes
- No

How often do you usually purchase fashion items online per month?

- Zero
- Once a month
- 2 to 3 times a month
- 4 to 5 times a month
- More than 5 times a month

Which delivery method do you frequently choose the most?

- Pick up at stores
- Pick up at collection point
- Home delivery

To what extent do you care about sustainability in the delivery of your order?

Not at all 1 2 3 4 5 A lot

To what extent does the low-price matter to you in the service quality of last mile delivery when purchasing fashion online?

Not at all 1 2 3 4 5 A lot

To what extent does fast delivery matter to you in the service quality of last mile delivery when purchasing fashion online?

Not at all 1 2 3 4 5 A lot

To what extent does the option of sustainable delivery matter to you in the service quality of last mile delivery when purchasing fashion online?

Not at all 1 2 3 4 5 A lot

To what extent does the company that delivers matter to you in the service quality of last mile delivery when purchasing fashion online?

Not at all 1 2 3 4 5 A lot

When considering purchasing green/sustainable services, which of the following statements is more applicable to you?

- I don't consider if the services I buy are green

- I never buy green service
- I rarely buy green services
- I buy green services when they are available if the price is reasonable
- I buy green service when they are available even if the price is high

Do you think that you have to sacrifice habits if the company offers more sustainable delivery options?

- Yes
- No
- Not sure

Would you consider changing your purchasing habits if the company offered more sustainable delivery options?

- Yes
- No
- Not sure

How much do you trust distributors about the environmental performance of their own delivery service?

Not trust at all 1 2 3 4 5 Trust completely

Do you think online fashion retailers should take responsibility to act on environment protection?

- Yes
- No

Do you have any suggestions for online fashion retailers to improve their last mile delivery services? If yes, what are they?

own answer

Appendix B

Code Book - Customer perception and sustainable last mile delivery questionnaire

Question number	Description of variable	SPSS variable name	Coding instructions
1	Gender	Sex	1= female, 2= male, 3= other
2	Age	Age	1= "20 years or younger", 2= "21-30 years", 3= "31-40 years", 4= "41-50 years", 5= "51 years and above"
3	Which town in Sweden do you live in?	Living town	In geographical location
4	Do you buy fashion online? (ex. clothing, shoes, bags, accessories, etc...)	Buy online	1= Yes 2= No
5	How often do you usually purchase fashion items online per month?	Purchase online per month	1= "Zero" 2= "once a month" 3= "2 to 3 a month" 4= "4 to 5 a month" 5= "More than 5 times a month"

6	Which delivery method do you choose the most frequently?	Delivery method	1= "Pick up at stores" 2= "Pick up at collection points" 3= "Home delivery"
7	To what extent do you care about sustainability in the delivery of your order?	Care about sustainability	1= "Not at all" 2= "less" 3= "neutral" 4= "more" 5= "a lot"
8	To what extent does low price matter to you in the service quality of last mile delivery when purchasing fashion online?	Low price matter	1= "Not at all" 2= "less" 3= "neutral" 4= "more" 5= "a lot"
9	To what extent does fast delivery matter to you in the service quality of last mile delivery when purchasing fashion online?	Fast delivery	1= "Not at all" 2= "less" 3= "neutral" 4= "more" 5= "a lot"
10	To what extent does the option of sustainable delivery matter to you in the service quality of last mile delivery when purchasing fashion online?	Sustainable delivery	1= "Not at all" 2= "less" 3= "neutral" 4= "more" 5= "a lot"

11	To what extent does the company that delivers matter to you in the service quality of last mile delivery when purchasing fashion online (ex, PostNord, DHL etc...)?	Company that delivers	1= "Not at all" 2= "less" 3= "neutral" 4= "more" 5= "a lot"
12	When considering purchasing sustainable services, which of the following statements is more applicable to you?	Considering purchasing sustainable services	1= "I don't consider if the services I buy are green" 2= "I never buy green service" 3= "I rarely buy green services" 4= "I buy green services when they are available if the price is reasonable" 5= "I buy green service when they are available even if the price is high"
13	Do you think that you have to sacrifice something (such as high price, low speed delivery, or similar low-quality service) most often to be sustainable?	Sacrifice	1= Yes 2= No 3= Not sure
14	Would you consider changing your purchasing habits if the company offered more sustainable delivery options?	Changing purchasing habits	1= Yes 2= No 3= Not sure

15	How much do you trust distributors' claims about the sustainability of their own delivery service?	Trust distributors claims	1= "Not trust at all" 2= "trust less" 3= "neutral" 4= "trust more" 5= "trust completely"
16	Do you think online fashion retailers should take responsibility to act on sustainability?	Responsibility on retailers	1= Yes 2= No
17	Do you have any suggestions for online fashion retailers to improve their last mile delivery services? If yes, what are they?	Suggestions	Own answer