

Unattended Home Delivery of Food

Is It Possible to Accomplish with a New Delivery Solution?

Emma Albertz and Josefin Frank

DIVISION OF PACKAGING LOGISTICS | DEPARTMENT OF DESIGN SCIENCES
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MASTER THESIS



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Abstract

The online market for groceries is continuously growing. Many of the online grocery purchases are home delivered, and the model that is currently the most commonly used allows the customer to pick a delivery time slot. This means that the delivery routes must be adapted according to time windows, which results in inefficient routes, a lot of half-empty vehicles, and hence in costly deliveries for the logistics providers. Furthermore, time windows require the customer to be home during the delivery time slot, which is undesirable to many customers. In several customer surveys, customers state that they would rather not have to be home to receive their groceries.

This master thesis has been conducted in cooperation with Nowaste Logistics, a young logistics company that provides high-tech solutions. Given the current situation in the market, and the company's willingness to start providing a competitive logistics offer for e-groceries, this master thesis aims to develop a new delivery concept. This, by investigating different options, existing and upcoming, and requirements from a logistics, food and customer perspective. Additionally, the required technology and the customer preferences are examined.

In order to answer the research questions, a literature study and a case study have been carried out. The case study includes interviews and observations at the case company, logistics providers, online grocers, and other organizations within the food industry. Six critical success factors to consider when developing a new home delivery solution have been established:

1. Be able to perform deliveries of larger volumes, meaning, more delivered orders per route.
2. Enable unattended home delivery.
3. Be independent, available for all logistics providers to use.
4. Keep the cold chain unbroken until the customer comes home.
5. Meet the demands of both customers and logistics providers in terms of price and cost.
6. Keep the delivery safe from both theft and contamination.

A new home delivery solution, that is assessed to fulfill the critical success factors, is recommended to Nowaste. This, together with further recommendations for a successful implementation and future research within the examined area.

Keywords: Home delivery, last-mile logistics, unattended delivery, e-groceries and case study.

Sammanfattning

Matvaruhandeln på nätet växer och en stor del av matvaruinköpen online levereras med hemleverans. Den hemleveransmodell som idag används i störst utsträckning låter kunderna välja ett tidsfönster för när de vill ha sin leverans. Det innebär att rutterna måste anpassas efter olika tidsfönster, vilket resulterar i ineffektivitet och låg fyllnadsgrad i lastbilarna. Detta, i sin tur, gör att leveranserna blir kostsamma. Dagens hemleveranser kräver att kunden är hemma vid leverans, vilket av många kunder anses vara en nackdel. I flertalet kundundersökningar svarar majoriteten av kunderna att de helst vill slippa vara hemma för att ta emot sin leverans.

Detta examensarbete har genomförts tillsammans med Nowaste Logistics, ett ungt logistikbolag som tillhandahåller högteknologiska lösningar. Då marknaden har sett en stor tillväxt och företaget har ambitionen att erbjuda en konkurrenskraftig logistiklösning för mat som säljs på nätet, fokuserar detta examensarbete på att ta fram ett nytt leveranskoncept för blandade matkassar. Detta genom att undersöka både befintliga och framtida leveransalternativ, samt beakta de krav som finns ur ett logistiskt, matvaru- och kundperspektiv. Utöver detta undersöks även vilken teknologi som krävs, samt kundernas preferenser för matvaruleveranser.

För att besvara studiens frågeställningar har en litteraturstudie och en fallstudie genomförts. Fallstudien innefattar intervjuer och observationer gjorda hos Nowaste, externa logistikleverantörer, matvarubutiker online och andra organisationer inom livsmedelsindustrin. Sex kritiska framgångsfaktorer att beakta vid utvecklandet av en ny hemleveranslösning har tagits fram:

1. Möjliggöra leveranser av större volymer, eller fler levererade order, per rutt.
2. Möjliggöra obehövad hemleverans.
3. Vara oberoende och tillgänglig för alla logistikleverantörer.
4. Bibehålla en intakt kylkedja till kunden kommer hem.
5. Möta både kundernas och logistikleverantörernas krav på pris respektive kostnad.
6. Skydda varorna från stöld och kontaminering.

I detta examensarbete rekommenderas Nowaste en ny hemleveranslösning som bedöms uppfylla framgångsfaktorerna. Detta, tillsammans med rekommendationer för en framgångsrik implementation och framtida forskning inom ämnet.

Nyckelord: Hemleverans, sista milen-logistik, obehövad leverans, mathandel online, fallstudie.

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We would also like to thank everyone who participated in our interviews at other companies. Your inputs and thoughts have been very helpful for the work of this master thesis.

Special thanks to our academic supervisor, Henrik Pålsson, for his guidance and support, and for giving us important input throughout the entire project. You have challenged the way we think, which continuously has improved the thesis.

Lund, May 2017



Emma Albertz



Josefin Frank

List of Acronyms and Abbreviations

A list of the used acronyms and abbreviations used in this master thesis is provided, in order to simplify the reading.

B2C	Business-to-Consumer
CEO	Chief Executive Officer
COO	Chief Operating Officer
CSCMP	Council of Supply Chain Management Professionals
ESL	Electronic Shelf Labeling
HACCP	Hazard Analysis and Critical Control Points
LTL	Less-Than-Truckload
PC	Personal Computer
RQ	Research Question
SC	Supply Chain
SCM	Supply Chain Management
SRS	Svenska Retursystem
SST	Self-Service Technology
WMS	Warehouse Management System

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1 Introduction

The following chapter initiates the project by establishing the background to the master thesis, the underlying problem, purpose and research questions (RQs). Furthermore, the first chapter will present some delimitations to the work and an outline of the report.

1.1 Background

The following section will cover the theoretical background and the company background of Nowaste Logistics AB, from now on referred to as Nowaste.

1.1.1 Theoretical Background

The global e-commerce sales have seen a steady growth in recent years. The retail e-commerce sales worldwide have grown from 1 336 billion US dollars in 2014 to 1 915 billion US dollars in 2016, and are expected to grow to 4 058 billion US dollars in 2020 (Statista 2017). As the e-commerce continue to grow, its share of the total retail sales has grown to 8.7 percent in 2016. This share is expected to increase to 14.6 percent, when the sales reach 4 trillion dollars by 2020 (emarketer 2016). The e-commerce industry has been driven by the development of shoppers using mobile devices to make their purchases. In the first quarter of 2016, almost 19 percent of all e-commerce sales came from mobile devices (Business Insider 2016).

The development of global e-groceries sales has followed the overall online retail sales. The sales of groceries online grew by 15 percent in 2016 and currently account for 4.4 percent of the global market for groceries, which means yearly sales of 48 billion US dollars. These numbers are expected to grow to 9 percent of the global market and 150 billion US dollars in sales by 2025. Even though the online grocery sales are steadily growing on a global basis, a slight variance can be

seen among different regions, where the level of internet availability affects to what extent the growth can be adopted in that region (Melton 2016).

In a survey investigating the future landscape of online grocery shopping, conducted by The Nielsen Company, 30 000 respondents in 60 countries shared their current shopping behaviors and what channels they are willing to use in the future. Among the respondents who are shopping for groceries online, the majority choose to get the food delivered to home. Millennials (ages 21-34) have the largest share of 30 percent who are ordering groceries online for home delivery, compared to 28 percent of Generation Z (ages 15-20), 22 percent of Generation X (ages 35-49), 17 percent of Baby Boomers (ages 50-64) and 9 percent of Silent Generation (ages 65+). Moreover, the current usage of the three other e-commerce options investigated in the survey (in-store pickup, virtual supermarket and automatic subscription) is greatest among the youngest respondents; who are also the most willing to use all of the e-commerce channels in the future (The Nielsen Company 2015, p. 8).

As the online sales of groceries has grown, so has the importance of planning the last-mile logistics. The last mile is defined as the last distance of transporting goods from a warehouse to its final destination. This is a crucial part for many companies since it covers for 50 percent of the total logistics costs, and is one of the least efficient and most polluting parts of the Supply Chain (SC) (Gevaers, van de Voorde & Vanellander 2010, p. 2). The last-mile delivery typically implies a face-to-face interaction between the delivery man and the customer, delivering at the doorstep of the customer. This interaction can potentially affect the future relationship between the selling company and the customer (Miller 2015).

A secured transport means that the food is delivered to the receiver in the same condition as it left the sender (Livsmedelsverket 2014, p. 12). The fact that the cold chain of food products is sensitive can complicate the last-mile logistics. Some food products are fragile to for example vibrational shocks, moisture, light and temperature fluctuations, where even small varieties can cause a direct visual-, taste- or even disease effect (Somogyi, Ramaswamy & Hui eds. 1996:01, p. 383). Another reason for the complexity of the cold chain is the great variety of the product requirements. One transport can contain different products which are not only temperature sensitive but also have different requirements; for example can not the temperature when transporting minced meat exceed +2 °C and for dairy products +8 °C (Livsmedelsverket 2016, p. 11). All of these factors add to the conclusion that the SC of food products is very complex; including the last-mile logistics.

1.1.2 Background of Nowaste Logistics

Nowaste is a young company with high-tech logistics solutions for several different industries; such as groceries (primarily fruit and vegetables), construction and hardware supplies, furniture and clothes (Nowaste Logistics n.d.). The company is owned by Everfresh, Sweden's largest importer of fresh fruit and vegetables, and is a part of the company group Total Produce Nordic (Everfresh 2017; Nowaste Logistics 2016). Total Produce Nordic is in turn part of Total Produce plc, which is one of the world's largest and accomplished fresh produce providers (Total Produce n.d.).

The chief executive officer (CEO) of Nowaste, Johan Kallin, states in an interview (2017) that the delivery of groceries comes with a big challenge because of the perishable nature of the products. Nowaste are not currently performing home deliveries of food, but do deliver fresh fruit and vegetables to grocery stores. The company is however, through their suppliers, performing home deliveries of other kinds of products; such as furniture, hardware supplies, and cosmetics. But with Sweden's largest importer of fruit and vegetables as their most important employer, the company's interest lies in solutions for home delivery of food products. Another incentive behind the field of the study is that Nowaste are currently negotiating with a customer regarding a potential contract for handling the home deliveries of prepacked grocery bags and loose goods in the southern part of Sweden. Kallin furthermore points out the lack of delivery solutions that are appropriate for delivering groceries, and are motivated by the possibility to implement a solution that could be useful for the entire industry (Kallin 2017).

1.2 Problem Formulation

For Nowaste, as for many other logistics companies focusing on business-to-consumer (B2C) e-commerce, the home delivery logistics is one of the biggest challenges. This part of the SC, also referred to as "the last mile", is known as one of the most expensive and critical operations due to the consumers' un-even demand for delivery time slots and hence the high degree of trucks running empty. Furthermore, some trends in consumer behavior anticipate that a more flexible delivery window is demanded in the future. The special requirements for transporting groceries adds another dimension to the problem.

The customer confirmation for receiving a package creates the most substantial problems associated with the last mile. If a time window for the delivery has not been established, there is a great possibility that the customer is out when the delivery arrives and therefore unable to receive the package and sign the delivery receipt. The delivery service is then forced to continue and come back at another time. This makes the delivery routes both costly and ineffective. However, if a delivery window is established beforehand this often leads to much longer, and thereby more expensive, delivery routes (Gevaers et al. 2010, p.6). Unattended delivery is an option that solve some of those issues. However, for unattended home delivery options, the security of the delivered goods from the time of delivery until the customer picks it up, is an issue. The fact that the delivered package is bulky must also be considered when designing a solution.

The requirements for home delivery of food products differ from the requirements of other e-commerce products. A mix of food products packed together requires consideration of the specific needs for each food type. For example, sensitivity to temperature and damage differ between different types of groceries.

Summarizing the problems:

- **Last-mile delivery.** The need for customer interaction makes the routes inefficient and thereby costly.
- **Security of unattended deliveries.** Unattended deliveries must be protected against theft.
- **Complex logistics.** The products to be delivered are of sensitive nature. They therefore demand specific conditions, in terms of temperature etcetera, throughout the SC. This, in order to be able to ensure the quality of the delivered products.
- **Price sensitive market.** High demands on separate and cooled transports has a negative impact on the already small profit margins.
- **Sensitive customer relationships.** The customers are price sensitive and time limited. Many of them would rather not have to be home to receive their delivery.
- **Bulky packaging.** The packaging to be delivered have a size equivalent to a filled grocery bag. Space requirements must be accounted for when designing a solution.

1.3 Purpose

The purpose of this thesis is to examine home delivery solutions for groceries, identify critical success factors, and based on these success factors develop a new conceptual home delivery solution.

1.4 Objectives

The goal of this thesis is to provide support for decision making when choosing the last-mile delivery option for groceries by investigating different options, existing and upcoming. The goal is also to provide Nowaste with recommendations for an unattended home delivery solution suitable for their company.

1.5 Research Questions

To be able to find an appropriate solution to the problems and thereby fulfill the purpose of this thesis the following RQs were chosen:

- RQ 1. What delivery solutions are currently seen in the market for e-groceries?
- RQ 2. What conditions are required in the solution considering food product requirements of transporting chilled and frozen food?
- RQ 3. What are the logistical requirements that has to be fulfilled, in terms of cost, flexibility, quality and time, for the solution to be efficient?
- RQ 4. For the proposed solution, what type of technology is required?
- RQ 5. What consumer preferences are there for home delivery of groceries?
- RQ 6. What are the requirements for the solution from the customer's perspective?
- RQ 7. What are the critical success factors for home delivery solutions?

1.6 Delimitations

When conducting research for this thesis, the focus is directed towards the market for home delivery of food, and even more specifically of groceries ordered online. The thesis does not include home delivery of food such as cooked meals from restaurants etcetera. Neither do the thesis cover home delivery of other e-commerce products. The research within this thesis focus on home deliveries to private customers. The proposed solution is tailored to suit the Swedish market.

1.7 Report Outline

This section will provide a short review of the report outline; that is, a short a summary of every chapter in the report. Additionally, some of the key topics discussed in the different chapters will be evaluated.

Chapter 1 Introduction

For this chapter, the subject of the research will be presented, together with current statistics and trends within the market of analysis. Furthermore, the background of the case company, problem description and purpose behind the study will be presented. Finally, the reader will be introduced with the RQs, delimitations and the outline of the report.

Chapter 2 Methodology

This chapter will present the methodological approach used in this master thesis. It describes the methods and strategies used in the research, data collection and analyzes. It will also discuss credibility of the study and findings.

Chapter 3 Frame of Reference

A background of earlier research in the field are presented in this chapter. It contains a general introduction to Supply Chain Management (SCM) and last-mile logistics along with a more detailed examination of the last-mile logistics for home delivery of groceries. Existing and upcoming solutions for e-grocery delivery are presented to the reader.

Chapter 4 Food Product Requirements

This chapter will concretize the specific requirements for transporting and delivering groceries, in terms of temperature, security and packaging. Furthermore, it will summarize the findings from theory in a shortlist.

Chapter 5 Findings

In this chapter the findings from the case study will be presented. An empirical data collection is completed, for which the results from interviews and observations will be presented. The interviews will be summarized in a number of key takeaways, that are persistent among the interviewees.

Chapter 6 Analysis

This chapter includes an analysis of the findings from the previous chapters. The analysis is based on five key themes, identified within the key takeaways from the theory and interviews. A gap analysis is performed to find existing gaps between how home deliveries are currently performed and the desired approach. Finally, six critical success factors for developing a new delivery solution, are identified.

Chapter 7 Solution

In this chapter, the home delivery solution developed by the authors is presented. The solution will be presented as a concept, meaning the whole system including different attributes for villas and apartments, different measurements, temperature adjustments, cost structure, the delivery network, and technology and applications. The system has been developed based on the findings and the critical success factors obtained during the master thesis research. The aim of this chapter is to describe the recommended solution, and how it would serve goods owners, logistics providers and customers in the delivery network.

Chapter 8 Discussion

In this chapter, the recommended solution and its features will be discussed as well as the chosen research method and how it might have affected the findings.

Chapter 9 Conclusion and Final Remarks

This final chapter of the master thesis report will provide answers to the RQs presented in Chapter 1. Additionally, a concluding recommendation to the case company is provided, together with a proposal for future research within the research field. The answers to the research RQs, the recommendation to Nowaste, and the suggestions for future research are based on the findings from previous chapter.

2 Methodology

This chapter will present the methodological approach used in this master thesis. The research strategy is presented, as well as the research design. Furthermore, the reader will be introduced to how the data are collected and analyzed. The chapter will be concluded with methods and discussions regarding the credibility of the project.

2.1 Research Strategy

When conducting this master thesis, the authors have chosen to take an exploratory approach together with an abductive reasoning approach and use a qualitative research strategy. There are three types of studies; exploratory, descriptive and explanatory. The purpose of exploratory studies is to gain a deep understanding of a phenomenon, while descriptive studies focus on describing a phenomenon, and explanatory studies aim to explain a phenomenon (Höst, Regnell & Runeson 2006, p. 29). Since home delivery of groceries is a relatively young market, and the purpose of this master thesis is to find a new way to deliver food to the front door, the exploratory approach is deemed to be the most appropriate.

The abductive approach is chosen since it is considered to be a good research approach when the goal is to develop new knowledge, which is the case for this master thesis. Deduction and induction are both more focused on establishing relations between known structures, rather than developing new knowledge. The first step in the abductive approach is real-life observations. The findings from the observations are then matched with theories in an iterative process. Data are collected and theory is built simultaneously, which creates a learning loop. A new theory is then suggested together with final conclusions and hypotheses. The final step is to apply the conclusions in an empirical setting. In the abductive approach a creative element can consciously be introduced by the researcher by applying new theory to an existing phenomenon. The purpose of abduction is to develop an

understanding about a new phenomenon and to suggest new theory (Kovács & Spens 2005). The authors intend to find a new solution to perform home deliveries by studying concepts used today, literature and new technology. Finding a new solution requires a process that allows for innovation and thinking outside the box. Therefore, the abductive approach is considered to be the most favorable.

The data collected during the research can be of either quantitative or qualitative nature. Quantitative data gathering focuses on collecting large data samples that can be processed using statistical analysis. Qualitative data gathering on the other hand are focused on words and descriptions, which are typically analyzed using sorting and categorization (Höst et al. 2006, p. 29). In this master thesis, the main part of the collected data is qualitative. According to Starrin and Svensson (1994, p. 23), qualitative data gathering are well suited when using an abductive reasoning approach for exploratory research.

2.2 Research Design

In an elementary sense, the design or modeling of a research is a logical sequence that relates the empirical data, the RQs and the conclusions to each other. The research design guides the researcher in the processes of gathering, analyzing and interpreting the data. The research design can also be viewed as a structure for the research handling four problems; what questions to study, which data are relevant, which data to collect and how to analyze the results (Yin 2003, p. 39). Yin (2006, p.40) goes on to define five components that are of importance when determining the research design;

1. Research questions
2. Hypotheses
3. Analysis units
4. The logical connection between data and hypotheses
5. Criteria of how to interpret the results

The RQs (1) are determined in the beginning of this master thesis and are designed to help the authors find requirements for a new home delivery solution. Once the RQs are established, depending on the nature of the RQs, suitable methods for the research can be chosen. A case study can be used to answer RQs in “what”-format when the research strategy is exploratory (Yin 2003, p. 19) and is therefore deemed to be suitable for this master thesis. The RQs can be found in Section 1.5.

It is important to design the case study and choose the analysis units (3), in order to make sure that the sought information can be found inside the scope of the case (Yin 2006, p. 42). Therefore, the case study in this master thesis includes both internal activities at Nowaste, activities at companies that perform home deliveries of groceries today, as well as external activities at logistics providers and other organizations. More about the case study in Section 2.4. A case study works well with the abductive research approach since the primary aim of abduction is to develop understanding of a new phenomenon (Kovács & Spens 2005).

A literature review is conducted as a complement to the case study. The literature review is used both to complement the findings from the case study and to compare the collected data with theory. The findings from the case study is compared to the theory in order to find similarities and differences. This is done in an iterative process which results in a requirement specification for a new solution. The following analysis units are chosen for this master thesis; Nowaste, logistics providers, online grocers, other organizations and selected literature. Yin (2006, p. 47) states that it is hard to instruct how (4) and (5) should be accomplished, but that the research design should include information on what will be done after the data are gathered. The collected data from the case study are analyzed using Grounded Theory and gap analysis, see Section 2.6. In an abductive approach, the hypotheses (2) are formed and new theory suggested after the research is done. For this master thesis, the conclusions form a requirement specification for a new solution.

2.3 Literature Review

A literature review is an important component of a master thesis since it is a part of the foundation for good scientific methodology. A well performed literature review supports the goal of a master thesis, which is to build on existing knowledge and reduce the risk of repeating prior mistakes made within the research area. A literature review should be an iterative process consisting of the following activities; keyword identification, literature search, source selection, evaluation, and summary. In the initial phase of the master thesis, the literature review is an important tool that helps the researchers design the RQs and delimitations in a proper manner. After the initial phase, further literature review can be done focused on an more specific area (Höst et al. 2006, pp. 59-60).

An initial literature review is done in order to increase the authors' knowledge on the subject. Relevant search topics are identified and a broad scope of literature are scanned. The keywords used in the search are found in Table 2.1 below. The search is completed through usage of available literature in libraries and online bibliographic databases accessed through LUBsearch, the online library of Lund University. Relevant material is selected and used in the thesis. A focused literature review is conducted to help find available solutions in the market (RQ 1), food product requirements (RQ 2), logistical requirements (RQ 3), and consumer preferences (RQ 5). For this, governmental web pages such as Livsmedelsverket, consumer reports from organizations within the e-grocery industry, and web pages for companies in the business of home delivery of groceries are used.

Table 2.1. *Keywords used in the literature search.*

<i>Keywords</i>
<i>Online Grocery Sales, last-mile logistics, Consumer Preferences, Food Requirements, Home Delivery, Temperature Requirements, Swedish market, Future Delivery Solutions, Self-service Technology (SST), Transporting Food Products, Less-than-truckload (LTL), Food Packaging</i>

2.4 Case Study

As a part of this master thesis a case study is performed. The scope of the case study includes Nowaste, logistics providers, online grocers performing home deliveries, and other organizations. This, in order to gain an understanding of what the Nowaste employees expect from a home delivery solution and how a new delivery solution would affect their daily operations. Furthermore, the scope is set to investigate what the logistics providers, online grocers and other organizations view as potential improvements in the last-mile logistics, and examine how things are currently performed in the e-grocery industry. The study can however be seen as a single case study, where the data collected at logistics providers, online grocers and other organizations are used to increase the scope and the credibility of the study. Yin (2003, p. 13) gives the following definition of a case study.

A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident.

According to Höst et al. (2006, p. 33), a case study is a good way to gain insight into an organization in order to understand how it works. A case study can also

help to gain a deeper insight into a phenomenon. When conducting a case study, the gathered empirical data are mostly qualitative. In a qualitative study, it is important to use several different sources to get a nuanced picture of the studied phenomenon. One way to do this is through interviewing personnel in different positions and roles, and review documents. In a case study, the empirical data can be gathered using three different techniques; interviews, observations and archive analysis (Höst et al. 2006, p. 34). The data for this thesis are collected mainly by performing interviews, as well as observations at online grocers that perform home deliveries of groceries today. More about the data collection methods in Section 2.5.

The design of a case study is flexible, and questions and directions can change during the study (Höst et al. 2006, p. 34). A case study is therefore suitable for this master thesis and the chosen abductive research approach, since it can be adapted to new knowledge and when theories are formed. According to Yin (2003, p. 24), case studies are suitable strategies in order to answer RQs of exploratory nature. The case study is used to help answer RQ 1, RQ 2, RQ 3, RQ 4 and RQ 6.

2.5 Data Collection

Both primary and secondary data are collected and analyzed when conducting this master thesis study. Advantages and disadvantages of using primary and secondary data collection methods are presented in Table 2.2 below. The literature review (see Section 2.3) can be seen as a secondary data collection method, which is data collected by other researchers or for other purposes than research, such as official statistics, organizational records, or governmental regulations (Hox & Boeije 2005, p. 596). There is a great variety of secondary qualitative data, but it typically takes the form of documents. That is for example sales reports, financial statements, customer details, company information, and reports from retailers and distributors (Business Jargons n.d.). For this case, the qualitative secondary data are collected from a number of sources, such as government censuses (like Livsmedelsverket and Brottsförebyggande rådet), business journals, books and business magazines. The quantitative secondary data are obtained through surveys and statistics from various organizations.

The primary data are mainly qualitative, gathered from semi-structured interviews and observations. The objective when performing a qualitative analysis is to study, or interview, people with different perspectives on how the observed element is

performed. This, by varying external factors such as age, position and gender in order to trace down variations in how people perceive the current situation within the examined area (Höst et al. 2006, p. 34).

Table 2.2. *Advantages and disadvantages when using primary and secondary data collection methods (Tripathy & Tripathy 2015, p. 65).*

	<i>Advantages</i>	<i>Disadvantages</i>
<i>Primary data</i>	<ul style="list-style-type: none"> • Original and relevant data. • Various ways to collect data. • The data are current. • High reliability. 	<ul style="list-style-type: none"> • Coverage is limited. • Time and money consuming. • Survey issues: questions must be simple to understand and respond. • Interviewers must be trained in order to ensure reliable results.
<i>Secondary data</i>	<ul style="list-style-type: none"> • Cheap and fast to access. • Easy access to the best scholars all over the world. • Could help create a frame for the field of research. • Could add value and new insights to already performed studies and analyzes. 	<ul style="list-style-type: none"> • Hard to ensure reliability. • Geographical differences may result in the data being inaccurate. • Time causes the data to become obsolete and old. • Secondary data could distort the results of the research. • Authenticity and copyright issues.

The objective when performing semi-structured interviews with Nowaste employees is to gather data and to help answer RQ 2, RQ 3 and RQ 4. Complementary interviews and observations are conducted with external parts in Nowaste’s logistics chain and with competitors in the logistics and the food industry, offering solutions for the last-mile logistics and home deliveries. Data from the observations are integrated as auxiliary data to the literature review and the interviews, and can be seen as a confirmatory research (Jamshed 2014, p. 88). Bowen (2009, p. 28) argues that by combining the three data collecting methods as a means of triangulation, a confluence of evidence that contributes to the research credibility is provided.

2.5.1 Semi-Structured Interviews

Semi-structured interviews are performed in order to develop an extensive data collection and to help answer RQ 2, RQ 3 and RQ 4. Interviews that aims at researching one specific field could be either structured, unstructured or semi-structured. Semi-structured interviews use a set of open-ended questions to support the interviewer, but the exact order and formulations are not definite. Furthermore,

it is recommended to record the interviews in case the interviewer would miss some key points (Jamshed 2014, p. 87). This is done with the permission of the interviewees.

The semi-structured interviews can be divided into four interviewee groups, namely interviews conducted with Nowaste employees, logistics providers, online grocers and other organizations within the food industry. A summary of the interviews performed with representatives from the four interview groups is presented in Table 2.3. The purpose behind performing interviews at Nowaste is to understand the challenges in transporting chilled and frozen food, how transportation of food is currently performed within the company, as well as ideas and expectations of how the solution could be designed to suit the operations. Top management are interviewed in order to understand the strategic decisions within the company and the motivation behind the research topic. The logistics providers are interviewed in order to give the authors a deeper insight in the day-to-day activities of transporting food and how they perceive the possibility of a new delivery system. The interviews performed with online grocers are done in order to get first-hand information from companies that are currently operating online sales and are familiar with the actual issues that comes with home deliveries of groceries. In order to gain a more in-depth understanding of the perishable and challenging nature of transporting fresh food, two interviews are performed with representatives from independent organizations within the food industry.

Table 2.3. *The number of interviews conducted with the four interview groups, and the purpose of performing interviews with representatives from companies within each group.*

<i>Number of Interviews</i>	<i>Interviewee Group</i>	<i>Purpose</i>
5	Nowaste employees	To understand the current activities and challenges of transporting food, and the expected performance of a new delivery system.
3	Logistics providers	To get an insight in the day-to-day activities of transporting food, and how a new delivery system would be perceived by these companies.
3	Online grocers	To get hands-on information on the current issues that comes with home deliveries of groceries.
2	Other organizations	To gain a deeper understanding of the perishable nature of transporting fresh foods.

Interviews in this master thesis are held until data saturation is reached. For qualitative case studies, data saturation is commonly used among researchers as a guiding principle during their data collection (Mason 2010). According to Bernard

(2012) (see Fusch & Ness 2015, p. 1409) it is not possible to state a common number of interviews for all qualitative studies in order to reach data saturation, but rather that the researcher should “take what he can get”. Interviews are therefore held for as long as the authors find new interviewees with relevant knowledge, and up until no more relevant information related to the RQs are obtained.

In total five interviews are conducted at Nowaste, whereof two interviews are performed with top management executives, two interviews with coworkers from the transport department, and one interview with an employee involved in business development. Among the logistics providers, three interviews are performed with employees at DB Schenker, Bring and Rolf Viebkes Åkeri. However, in total four employees with knowledge in home deliveries are interviewed, since the interview with Bring covers two coworkers in the same interview. The selected online grocers to interview are ICA and MatHem. An e-mail interview are conducted with a MatHem employee, and two phone interviews with coworkers from ICA Södra Sandby and ICA Mobilia Lund. The interviewee group “other organizations” are represented by a self-employed chef and food writer, and by an employee at Konsumentföreningen Stockholm. A full review of the conducted interviews and the interviewees’ positions are presented in Table 2.4 below. The table also presents the form of interview communication (personal, phone or e-mail) and the dates and lengths of the interviews. For more information regarding the interviewees’ positions and responsibilities, see Section 2.5.1.1 below.

Table 2.4. Information about the interviews, the interviewees' positions, the form of communication and the interview dates and lengths.

<i>Company</i>	<i>Interviewee's Position</i>	<i>Form</i>	<i>Date</i>	<i>Length</i>
<i>Nowaste Logistics</i>	CEO	Personal interview	2017-03-16	57 min
<i>Nowaste Logistics</i>	Vice President	Personal interview	2017-04-05	53 min
<i>Nowaste Logistics</i>	Transport Manager	Personal interview	2017-03-16	58 min
<i>Nowaste Logistics</i>	Transport Manager	Personal interview	2017-03-21	59 min
<i>Nowaste Logistics</i>	Business Development Manager	Personal interview	2017-03-21	60 min
<i>DB Schenker</i>	Transport and Operations Manager	Personal interview	2017-03-23	1 h 2 min
<i>Bring</i>	Quality of Operations and Business Development Manager	Personal interview	2017-03-28	1 h 22 min
<i>Rolf Viebkes Åkeri</i>	Chief Operating Officer (COO)	Personal interview	2017-03-31	48 min
<i>MatHem</i>	CEO assistant	E-mail interview	2017-02-15	-
<i>ICA</i>	Online Sales Manager, ICA Södra Sandby	Phone interview	2017-02-10	13 min
<i>ICA</i>	Online Sales Manager, ICA Mobilia Lund	Phone interview	2017-03-15	49 min
<i>Self-employed</i>	Chef and food writer	Personal interview	2017-03-21	1 h 11 min
<i>Konsumentföreningen Stockholm</i>	Sustainability and Customer Manager	Phone interview	2017-04-07	25 min

An interview guide is developed in order to facilitate the interviews. The structure of the interview guide for a semi-structured interview is much less regulated than for a structured interview. In fact, the format can vary between a list of topics that should be covered in the interview, to a predefined list of questions. The vital part of an interview guide is that the topics or questions are formulated to cover the areas of interest and contributes to answering the RQs (Bryman & Bell 2003, p. 369). The interview guides for this study are adjusted to suit the different companies and interviewees. Therefore, a few topics differ between the interview guides for the top management executives, the Transport Managers and the Business Development Manager at Nowaste. The interview guide for the logistics

providers is also separated from those at Nowaste, and the same goes for the online grocers and the other organizations. The interview guides are presented in Appendices A-F. Even though some topics differ between the different interview guides, many of the questions are structured to facilitate asking several interviewees the same questions. This, in order to help reach data saturation during the interviews.

During the interviews, the authors aim at gathering some data of a quantitative manner as well. This, in order to provide the study with some measurable and comparable results, and to find out what factors that are the most important to consider when developing a home delivery solution. The interviewees are therefore asked to rate a number of parameters, based on the importance to the delivery concept, the customers, and to Nowaste. The interviewees are asked to answer the following questions:

1. How do you rate the importance of the following factors to the delivery concept?
 - a. Ease of route planning *due to for example no need of time windows.*
 - b. Optimized vehicle fill rate *by enabling usage of for example stackable secondary packaging.*
 - c. Possibility for pickup *24/7 for customers*
 - d. Adaptability *to different products with different requirements*
 - e. Security *to prevent for example break-ins*
 - f. Scalability: *ease of scaling up the solution to larger volumes.*
2. How do you rate the importance of the following factors to the customers?
 - a. Cost
 - b. Convenience
 - c. Speed
3. How do you rate the importance of the following factors to Nowaste Logistics?
 - a. Cost
 - b. Short implementation process
 - c. Available technology
 - d. Uniqueness

The first and second question are asked to all of the interviewees, except from the online grocers and the representative from Konsumentföreningen Stockholm. This, since these interviews are performed either by phone or by e-mail and it is estimated that it would be too difficult to ask for this kind of responses during

anything but a personal interview. The third question is only asked to the Nowaste employees, since it requires a deeper understanding of the motivation behind the research topic and how the company would prefer to handle the implementation process. In total ten employees are asked to answer the first and second question, and four employees are asked to answer the third question.

2.5.1.1 Positions and Responsibilities

The following section will provide some more insights in the interviewees' positions and responsibilities.

Nowaste Logistics

Out of the five interviewees from the management team at Nowaste, two of them represents top management. That is, the CEO and the vice president of Nowaste. Among the remaining three coworkers, two work as Transport Managers and one as a Business Development Manager. The Transport Managers are in charge of the distribution flows to and from the warehouse in Helsingborg, and of developing and improving the logistics offers to customers. There are also unofficial roles within the team, where one of the Transport Managers are more focused on the operational work, while the other one are targeting development of logistics and organizational issues in the transport department. The Business Development Manager is responsible for project leadership and business development for one of their largest customers; Bolist Logistik.

Two of the interviewed Nowaste employees have worked at the company for less than six months. The rest of the interviewed team members have worked within the company for between two and a half years to eight years. One of them have had direct experience of working with home deliveries, from a previous employment as a Logistics Manager at a company performing approximately 100 000 home deliveries a year.

Logistics Providers

Out of the four interviewees, three of them represents operations at their companies. The coworker from DB Schenker is titled Transport and Operations Manager, which he has been for the last seven years. He is responsible for their customers within the food industry; ICA, Coop and Nowaste. Out of the two interviewees at Bring, one of them has been working with quality of operations and the coordination of product flows, from production to receiving at the customer facilities, since 2012. The second interviewee has held the position as Business Development Manager for three months. He has however previous experience of the existing challenges when it comes to transporting food, from a

former position as a Product Flow Manager at a company within the food industry. The interview at Rolf Viebkes Åkeri is performed with the COO; a position that he has held for the last four years.

Online Grocers

Two of the interviewees hold positions as Sales Managers for the online department at their stores, and the third interviewee work as a CEO assistant at an online grocery company. One of the interviewees has been at the same store for five years and during that time always been involved in the online grocery sales. Another one has been employed by the same store for the last 14 years and has been involved in the online business for four years. The third interviewee has been with the online grocery company for almost two years.

Other Organizations

One of the interviewees used to be editor in chief at a food magazine and before that she worked as a chef. Nowadays, she runs her own company for which she takes on a variety of different jobs, all associated with food. She still writes food articles and recipes but now as a freelancer. She is also involved in different projects such as cooking camps for kids and helping small local food businesses with marketing, event planning, and how to reach out to their customers. The other interviewee works as a Sustainability and Customer Manager at Konsumentföreningen Stockholm, which she has done for the past 20 years. Her work includes questions regarding sustainability, environment, recycling and groceries. She has an education in land surveying and has previously worked at Lantbrukarnas Riksförbund.

2.5.2 Observations

As mentioned above, data from the observations can be seen as auxiliary data to the literature review and the interviews. The observations complete the data collection and makes up for some of the drawbacks with the other methods. One drawback with interviews as a data collection method is that there could sometimes be a difference between peoples' stated behavior and how they actually behave. Furthermore, the behavior of the interviewer could affect the responses from the interviewee. The interviewer could phrase the question incorrectly or formulate it in a way that makes the interviewee uncomfortable and therefore respond differently. One solution to these issues is to observe peoples' behaviors, without the need for methodological tools to obtain a result (Bryman & Bell 2003, p. 196).

There are different types of observation methods and for this study, an unstructured observation method is used. This means that, no schedule for observing and registering detected patterns is used in the investigated area. Instead, the purpose is to carefully observe how the participants acts in the examined environment and present it by giving a detailed narration. Most performed observations are unstructured but they are more common among non-participating observations. A non-participating observation means that the observers are passive and do not engage in the activities of the examined area (Bryman & Bell 2003, p. 197).

In order to help answer RQ 1, RQ 2, RQ 3, RQ 4 and RQ 6, in total four observations are carried out at ICA, Budmäster and Nowaste. The purpose of performing observations at ICA is to get an overview of the activities connected to home deliveries of groceries in store; such as picking, packing and storing the food. One observation is performed at ICA Södra Sandby, who use their own car and driver to deliver the food to the final customers. Another observation is performed at ICA Mobilia Lund, who handle the in-store activities of the home deliveries but outsource the transports to Budmäster. The third observation is therefore accomplished in cooperation with Budmäster, in order to provide the authors with an insight of hands-on problems and inefficiencies in the last-mile logistics. Additionally, one observation is carried out at Nowaste; a tour of the warehouse and its in-house operations. This in order to improve the understanding of the product flows and day-to-day activities operated in the warehouse. A full review of the conducted observations are presented in Table 2.5 below, including the observed activities, the dates and lengths of the observations.

Table 2.5. Information about the observations, the observed activities and the observation dates and lengths.

<i>Company</i>	<i>Observed activity</i>	<i>Date</i>	<i>Length</i>
ICA Södra Sandby	Picking and packing of grocery bags, delivery through parcel lockers and home deliveries.	2017-02-21	2 h
ICA Mobilia Lund	Picking, packing and storing of grocery bags in SRS boxes. Bags picked up by customers in the drive through and by Budmäster for home deliveries.	2017-03-27	2 h
Budmäster	Home deliveries to companies and private customers in Lund, Staffanstorps, Hjärup, Alnarp, Lomma, Bjärred and Kävlinge.	2017-03-27	8 h
Nowaste	Receiving, storing, picking and loading of mixed pallets and full-sized pallets, by hand and by the automated robots.	2017-04-05	1 h

2.6 Data Analysis

In order to analyze the empirical data collected during the interviews and observations Grounded Theory is applied. This method is the most common approach to analyze qualitative data. One definition of Grounded Theory by Strauss and Corbin 1998 (see Bryman & Bell 2003, p. 449) is the following:

Grounded Theory is theory derived from data that systematically has been collected and analyzed during the research process. In Grounded Theory, there is a close linkage between the data collection, analysis and the resulting theory.

The importance of having an abductive approach when applying Grounded Theory have been stated by several authors. Coffey and Atkinson stated in 1996 (see Richardson & Kramer 2006, p. 500) that “abductive reasoning lies at the heart of grounded theorizing”, and that existing theory should be used to develop ideas. A theoretical selection is therefore performed through a literature review, for which a first step of data collection, open coding and analysis of the results is completed. This, in order to reach a conclusion of what information is needed in the next step of the data collection. This is then done repeatedly until theoretical saturation is reached (Bryman & Bell 2003, p. 350).

As indicated above, coding is first performed on the data collected in the literature review. Data are also collected from the interviews, which are recorded and transcribed, as well as from written notes from the observations. The main idea of data coding is to identify keywords, concepts or categories. Coding is performed in three steps, where the first step is called open coding. That means, breaking down the data, study and compare the results, and categorize it into sub-concepts (Bryman & Bell 2003, p. 450). For this study, this is performed by transcribing the interviews and finding key takeaways among the interviewee responses and the literature review. The primary focus when coding the data is to find inefficiencies when delivering groceries to its final customers and potential improvements that could be implemented in the last-mile logistics. For the interviews, the key takeaways are identified by comparing the different answers among the respondents. The most commonly discussed themes are then identified based on the occurred frequency in the data. Similarly, within theory the key takeaways are withdrawn from the data based on the level of impact it has when performing home deliveries of groceries. In total, 14 key takeaways are concluded from the literature review, and 18 key takeaways respectively from the interviews.

The second step of the coding process is called axial coding, which is the process to analyze the sub-concepts and trying to find linkages between them, for example based on contexts, consequences or interaction patterns (Bryman & Bell 2003, p. 450). In this thesis, this is done by grouping the key takeaways together based on their content, in order to define themes among them. In the final step, core categories are selected through a selective coding process. The main goal when finalizing the coding is to have reached theoretical conclusions to be able to answer the RQs of the study (Bryman & Bell 2003, p. 450). The categories are selected based on the number of key takeaways that appear within every category, which results in five themes. The coding process furthermore results in that only two of the in total 32 key takeaways are not included in the selected categories. The results of the axial and the selective coding are presented in Appendix G.

The results from the coding process are then confirmed with the results from the observations. This provides the authors with an understanding of the gap between the current and the desired situation. A gap analysis is hence performed to acknowledge the differences in actual and desired performance, and to find possible solutions to eliminate these gaps. Furthermore, in order to answer RQ 7, the results from the analysis are used to establish six critical success factors for home deliveries of groceries. This, together with the rest of the results from the analysis are used to help the authors find which parameters to focus on, fulfill the master thesis purpose, and develop a successful home delivery solution.

2.7 Credibility

When conducting a case study, it is important to assess the credibility of the study. That is, how valid and reliable the study is. Some authors have suggested that qualitative studies should be reviewed and evaluated differently and based on other criteria than quantitative studies. A few factors and methods have been established over the years, in order to assess the credibility of qualitative research. Three common elements among these are validity, reliability and transferability (Bryman & Bell 2003, p. 306).

2.7.1 Validity

Whether a study can be perceived as valid or not, depends on if it measures the right things for the chosen area of investigation. Case studies often focus on

numerous variables for research; often many more than the number of sources for data collection. One key difference between case studies and other research methods is that case studies often seek to investigate a phenomenon in a specific context, rather than independent of a context. This means that data collected for a case study could sometimes be hard to replicate, and the ensurance of validity is therefore crucial (Gibbert, Ruigrok & Wicki 2008, p. 1466).

The theory distinguishes between internal and external validity. Internal validity could sometimes also be referred to as logical validity, and is associated with the linkage between the variables and the results. Internal validity refer to the phase of the work process for which data analysis is performed. A well prepared research framework and a strategy for analysis, that enables the authors to find and compare patterns between the empirical data and previous studies is recommended (Gibbert et al. 2008, p. 1466). To ensure the internal validity of this research project, semi-structured interviews with open-ended questions are used. This in order to avoid the risk of the interviewees being misled in their answers. For examples on the open-ended questions, see the Appendices A-F. All interviews are recorded and transcribed, and follows the same structure for analysis. In that way, comparable data are collected and the risk of premature conclusions is minimized. Furthermore, the process of coding the data and establish key takeaways are performed separately by the authors. The key takeaways are then compared and chosen based on the persistence among the two authors' perceptions on the results. Thus, the validity of the results is further increased.

The external validity is sometimes also referred to as generalizability, and is the theory that suggests research results to be analyzed in other settings than the one of investigation. As previously mentioned, contextual studies is a common issue among case studies, but does not mean that case studies could not use generalizing methods for the empirical data (Gibbert et al. 2008, p. 1468). For this master thesis, the studied phenomenon is only investigated in one setting. The risk of having a narrow mindset and making premature conclusions in the process is however avoided by broadening the set of studied people. By choosing interviewees with different positions, backgrounds and experience the risk of biased results is reduced. In that sense, the external validity is also assessed.

In order to increase the validity of the study even more, data are collected through three different methods. For the interviews, the perception of how home deliveries should be performed is collected from Nowaste, logistics providers, online grocers, and other organizations. Through the literature review, facts on how things must be performed according to Swedish regulations are studied. For the

observations, the authors get a view of how things are actually performed within the e-grocery industry. For this thesis, the purpose of using different data collection methods is to get different views on the investigated area, and gather information on both how home deliveries are, should and must be performed according to the different sources. This helps the authors to develop a new home delivery solution and contribute to the validity of the study.

The best way to test if a study can be seen as valid, is often by having other researchers reviewing the results and determine whether they are enlightening. This however often demands a lot of resources, and the researcher's claim for validity must hence rest on their own judgment (Jonsen & Jehn 2009, p. 126). To have other researchers evaluating this study has therefore not been possible to accomplish.

2.7.2 Reliability

Reliability is defined by Höst et al. (2006, p. 41) as the trustworthiness of the collected data and the analysis with respect to random variations. To accomplish high reliability, it is important to be thorough in the data gathering and analysis. By explaining the work process of the research to the readers, it gives them a chance to evaluate the approach. This chapter of the master thesis is therefore intended to describe the methodology and work process to the reader.

Höst et al. (2006, p. 42) suggest that asking a colleague to review the data gathering and analysis is a good way to improve the reliability of a study. Therefore, fellow students are asked to conduct a peer review of this master thesis in order to improve the quality before completion. In addition, both the academic supervisor and the external supervisor at Nowaste are continuously asked to give their input and guidance to this master thesis. Another way to increase the reliability is to select interview objects randomly (Höst et al. 2006, p. 42). In this master thesis the interview objects are not randomly selected. However, the authors select interview objects with different positions, experience and perspective in order to get a holistic view.

Bryman & Bell (2003) suggest that reliability is built by ensuring that the research is conducted according to existing rules, and that the results are reported to the participants of the study in order for them to confirm that the researchers have made correct interpretations. This master thesis is sent out to the interview objects and other participants in order to provide them a chance to give feedback before finalizing the report.

2.7.3 Transferability

Transferability is closely related to external validity, which refers to the extent that the results from a study can be generalized and applied in a different setting. Qualitative research often means an intense study of a small group of individuals that have similar characteristics, rather than a broad scope as in quantitative research. Therefore, the result of qualitative research is often connected to the setting in which the study is made (Bryman & Bell 2003, p. 307). According to Guba and Lincoln (see Bryman & Bell 2003, p. 307) qualitative researchers should provide so called “thick descriptions”, which are detailed descriptions of the study setting. This, in order to help the reader to evaluate if the results can be applied in another context. Even though this master thesis primarily collects data from Nowaste and focuses on the e-grocery industry, similar issues can be found in all industries performing home deliveries. This is confirmed by the general inefficiencies that exists in the last-mile logistics. The fact that these issues are the ones that are primarily assessed in this study indicates that the findings can be applied outside of Nowaste.

3 Frame of Reference

This chapter will present a background of earlier research and a theoretical framework of this master thesis. First, an introduction to concepts within distribution management will be presented. This, in order to understand the background of the field of research. Also, the Swedish market for e-groceries will be elaborated on, as well as existing and future online delivery solutions. Finally, delivery preferences of the customers are introduced. These sections contemplate to present the reader to current market trends and to provide a frame of reference.

3.1 Distribution Concepts

This thesis focus on solving the problems in the last-mile logistics. In order to understand this, a common understanding of the concepts and definitions within SCM, such as logistics, last-mile logistics, multi-channel distribution and Self-Service Technology (SST) is critical. These areas will be introduced in the following sections.

3.1.1 Logistics and Supply Chain Management

Logistics and SCM have developed over time and during the 1960s, companies started to regard logistics as an activity of management. Hence, organization and business strategy came to play a larger part of the leadership and the overall operations. In the 1970s, the focus of management started to evolve from total costs of logistics towards targeting the market and the customers. By improving the performance and the reliability of deliveries, logistics became a tool to increase customer satisfaction. All of this led up to the development of the concept SCM in the 1980s, when logistics started to be perceived as a potential competitive advantage and a critical part of the business strategy (Johannessen & Solem 2007, p. 21). The following definition of SCM was presented by Mentzer, DeWitt, Keebler, Min, Nix, Smith and Zacharia (2001, p. 18).

Supply chain management is defined as the systematic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole.”

Definitions of logistics and SCM vary across different authors, and the lack of a unified definition among logistics providers cause a source of confusion. Mentzer et al. (2001, p. 5) therefore suggests that if a single definition were to be used, research and practice within this area of management would be improved. There are important differences between the concepts of logistics and SCM, where for example managing logistics is described by the Council of Supply Chain Management Professionals (CSCMP) as a part of SCM. The latest definition of logistics management was presented in the Supply Chain Management Terms and Glossary by CSCMP (2013, p. 117).

Logistics is the process of planning, implementing, and controlling procedures for the efficient and effective transportation and storage of goods including services, and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements. This definition includes inbound, outbound, internal, and external movements.

3.1.2 Last-Mile Logistics

The last mile of the SC is the final distance in a B2C delivery. The transportation stretches from the point of shipping from the central warehouse to the receiver, either by using home delivery or through some sort of pick up solution. More about existing delivery solutions in section 3.3.1 below. When the goods are shipped from the storage facilities, it can either be distributed to traditional outlets, such as stores and supermarkets, or directly to customers. This final leg of direct delivery to customers is referred to as the last-mile delivery (Gevaers et al. 2010, p. 3).

The concept of last-mile logistics differs among various types of SCs. Gevaers et al. (2010, p. 4) present four subtypes of SCs; the semi-extended SC, the decoupled SC, the fully extended SC, and the centralized SC. The model is presented in Figure 3.1 below.

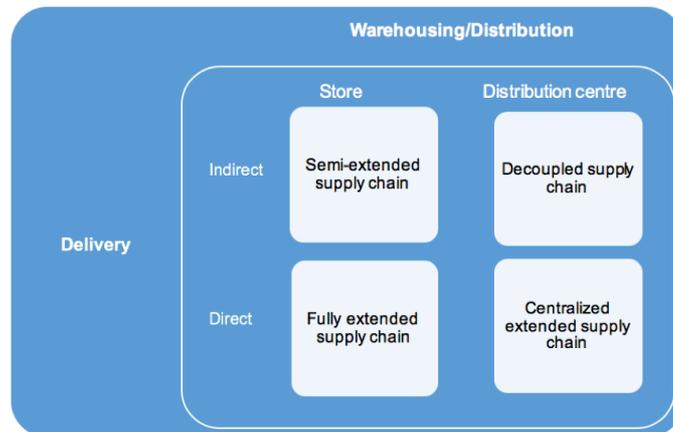


Figure 3.1. The SC matrix, resulting in different delivery solutions and last-mile structures (Replicated from Gevaers et al. 2010, p. 4).

The semi-extended SC uses traditional outlets for order picking, and outsources the logistics activities to a third party provider. Similar to this subtype, the fully extended SC also uses sales channels for order picking, but keeps the deliveries to customers in-house. The decoupled SC depends on central warehouses and external forwarders to deliver the goods the last mile. The last subtype, the centralized SC, uses the distribution centers for order picking, but the companies do the deliveries to the customers themselves (Gevaers et al. 2010, p. 4). The customer that Nowaste is currently negotiating with, regarding a potential contract of handling the customer’s home deliveries of groceries, would be categorized to have a semi-extended SC where the goods will be packed in store, and the deliveries outsourced to Nowaste.

As discussed in Section 1.1.1, the last mile is one of the most crucial parts in companies’ SCs, since it is one of the more expensive, the least efficient and most polluting parts of the SC (Gevaers et al. 2010, p. 2). Some of the existing challenges reported in the last mile are small delivery time windows, troubles in preserving temperature regulations, and the growing number of small orders to be delivered directly to customers’ homes. Longer time windows would simplify the planning and optimization of routes, but the customers would have to suffer from it (Punakivi, Yrjölä & Holmström 2001, p. 427). More about the existing challenges in preserving temperatures and optimizing small cargo transportations in Chapter 4.

3.1.3 Multi-Channel Distribution

The modern retail grocery landscape is evolving, and understanding the challenges of multi-channel distribution is essential in order to understand the complexity of grocery e-commerce. Although online sales and multi channeling could provide competitive advantages, it implicates complexity to the design and the management of the SC (Agatz, Fleischmann & van Nunen 2008, p. 340). The complexity is however directly linked to the chosen delivery concept of the goods to the customer. In the case of in-store pick up, the last-mile transportation is limited to the final movement of the groceries to the checkout counter. Home deliveries, on the other hand, add another level of complexity to the SC operations. Delivery of groceries using home deliveries, requires a cost-efficient handling of small orders and low-value items. This is a major challenge that comes with multi-channel retailing, and especially with low-value groceries, since transportation costs have a big influence on the company's competitiveness (Agatz et al. 2006, p. 347).

As customers increasingly are buying their groceries via a personal computer (PC), tablet or a mobile phone, some retailers are transforming their physical stores to warehouses. Already in 2012, McKinsey & Company identified seven trends for Retail 4.0: Multi- or Omni-channel grocery retailing, see Table 3.1 below. Even though the article was written a few years ago, the trends are assessed to be representative to this date. This, since several of the trends are focusing on sales through for example new channels, personal offers and digital marketing, that are still facing a rise in the market, not least in the market for e-groceries. Furthermore, the article is written from a global perspective, with several examples from the United States and the United Kingdom. These are countries where the e-grocery market is more developed than in Sweden. This implies that the trends are still of current interest to the Swedish market.

Table 3.1. Seven key trends seen in multi-channel e-grocery businesses according to McKinsey & Company (2012, pp. 5-8).

<i>Multi-channel trend</i>	<i>Description</i>
1. Continued rise of e-grocery “attackers”	Customers expect a continuous growth in the number of available shopping experiences across channels.
2. Thinking differently about the box	Technology raise the demands from customers, and physical supermarkets have to offer compelling customers experiences in order to compete.
3. Increasing importance of digital marketing, social media, and location-based services	E-commerce is about much more than online sales. The best grocery retailers are engaging in two-way communication and need to watch out for non-traditional competitors.
4. Sophistication of personalization and CRM	The importance of tracking customer data is increasing, and promotions continue to develop to targeted personal communication.
5. Advances in self-checkout and digital wallet	New ways to complete customer checkouts and advancements in mobile-based payment systems are developed by retailers.
6. Digital dashboards: shop floor customer service	With product descriptions, consumer reviews and brochures into the hands of the shop floor workers, customers can be answered a wide range of questions on the shop floor.
7. Dynamic pricing	In future, when Electronic Shelf Labeling (ESL) become more affordable for retailers, real-time or dynamic pricing will be operated by retailers to a larger extent.

To verify these seven trends, McKinsey & Company (2012) points at the fact that the increasing number of cell phones globally over the past years has resulted in an increased demand for multiple channels to shop online and distribute the items. Offering multiple channels to customers to shop and have products delivered can no longer be seen by companies as a “niche”, or something that could be limited to a subdivision of product categories or geographic areas (McKinsey & Company 2012, p. 9).

What distribution channels and launching strategies companies use is critical in order to minimize the cost of getting the products to market (Kotler 2003, p. 25). Kotler (2003, p. 25) furthermore states that “The biggest change happens in the distribution channels, not in methods of production or consumption of companies”. Using a multiple channel strategy comes with some challenges. First

of all, there is a risk that the quality decreases if the usage of multi-channel strategy implies that the company lose control of their operations. Secondly, it may result in the company having conflicting channels (Kotler 2003, p. 26). Within the e-grocery industry, the different channels of delivery could be in conflict with each other.

3.1.4 Self-Service Technology

SST is defined as different methods and processes to allow customers to complete the steps to purchase products and services on their own (Beal 2017). The concept has developed from today's fast-paced environment, where high-technology transaction solutions and the numbers of customers interacting with technology are growing (Meuter, Ostrom, Roundtree & Bitner 2000, p. 50). The traditional "high-touch and low-tech" interpersonal solution have been gradually supplemented, or replaced, by "high-tech and low-touch" transaction solutions. High-touch refers to situations when the customers need a lot of guidance through the sales process. Such interpersonal services that have recently been replaced with SSTs are for example airline check-in, hotel booking, and retail banking (Wang, Harris & Patterson 2013, p. 400). In retail grocery, SST has historically been defined by self-scanning checkouts, which was first introduced in the 1980s (Dabholkar, Bobbitt & Lee 2003, p. 60). With a growing number of online delivery solutions, the number of SSTs to complete grocery purchases has increased.

Currently, there exist one self-service delivery solution for groceries, cooled parcel lockers, since these require no human interaction between the salesperson and the customer. More about existing online delivery solutions in Section 3.3.1 below. The benefits of providing self-service solutions is that it puts the customers in control of the timing and the process of the purchase. This could potentially lead to increased customer satisfaction, loyalty and competitiveness of the company (Rust & Kannan 2003, p. 41).

According to a study performed by Bitner, Ostrom and Meuter (2002), SSTs are often perceived as a better alternative than interpersonal alternatives when looking at it from a customer perspective. It could save customers time and money, and provide easy access when no personal service is necessary. However, the quality of the SST performance need to be monitored in order to avoid errors and downtime in the system. If the SST fail to perform it could cause dissatisfaction among customers, independently of in what stage of the purchasing process the SST is introduced. The key takeaway for companies before introducing SSTs as a

part of their offer, is that if they cannot guarantee to fulfill their obligations and deliver value through the SST, the advantages perceived by the customers are lost. If the customers decide that using poorly functional technical solutions is not worth it, there is a risk that they will return to conventional methods instead (Bitner et al. 2002, p. 100).

The future of SST in the e-grocery industry is full of potential. The number of SST devices vary in different industries, and a large potential can be seen in the retail segment (Slawsky 2017, p. 3). The traditional in-store based model, where logistics focused on delivering full truckloads of goods, gained advantages from economies of scale. This dramatically changed when singled products were to be home delivered, adding complexity and cost to transport the goods the last mile (Petersen 2016). This could be solved by incorporating SST in the last-mile delivery solution, since it would remove the need of human interaction, increase the “drop concentration” and simplify the planning of routes. The aim of a high “drop concentration” is to deliver many packages to a single address at the same time, and hence, reduce the average delivery cost of a package (International Post Corporation 2013, p. 15).

3.2 Swedish Market for E-Groceries

During 2015, the online sales of groceries grew with 39 percent, according to a report from Svensk Digital Handel (2016, p. 2). In 2015, the total online sales of groceries in Sweden was 4,1 billion SEK, which corresponds to 1,4 percent of the grocery market. In 2016, the online sales were forecasted to increase with 38 percent, which means a turnover of 5,7 billion SEK (Svensk Digital Handel 2016, p. 6). If the forecast proves to be correct it means that online grocery sales has doubled in two years.

Online grocery sales can be divided into two major categories, loose goods and prepacked bags with dinner solutions. Earlier, the prepacked bags answered for the biggest part of the sales. However, in 2015 the sales of loose goods exceeded the prepacked solutions (Svensk Digital Handel 2016, p. 7).

Even though the online sales of groceries grow steadily, there are big challenges to overcome in order for the market to reach its full potential. One concern is how to make the e-commerce profitable outside the cities. The combination of an increasing number of market players and the competition from traditional grocery stores makes it hard to compete with pricing, which is the number one competitive

instrument in the traditional grocery market. For the e-grocery industry, a competitive advantage is rather gained by being cost effective through the purchasing and logistics strategy (Svensk Digital Handel 2016, p. 8).

There are currently at least 27 players in the Swedish e-grocery market, see Appendix H, and new actors are entering the market continuously. Several established grocery businesses such as ICA, Coop and Axfood have recently joined the e-commerce market (Svensk Digital Handel 2016, p. 9). According to the findings from the research within this master thesis, the companies in the online grocery industry can be divided into three categories; the established companies with physical stores who use their online channels as an additional service, those whose core business are e-groceries and those who have chosen to specialize within a niche, for example meat.

3.3 Online Delivery Solutions

What are the current options to deliver products ordered online, and what trends can be forecasted to be seen in the future? The following section will cover how e-products can be collected or delivered to the customers in the Swedish market today, and what is currently up and coming in this area of research. Existing delivery solutions have been identified by scanning the web for online grocers and by visiting their websites, in order to find what delivery solution they use.

3.3.1 Existing Solutions

There is a variety of delivery options available for online shopping. However, there is a difference among the retailers of how many options they offer their customers to choose from, according to a study from PostNord, Svensk Digital Handel and HUI Research (2016, p.17). The study is one among several studies of consumer preferences in the online grocery market, and the e-commerce business in general. One question that recur in many of the customer surveys is which delivery option the customers prefer, where the respondents are given a choice between different delivery options. More about the customer preferences in Section 3.4 below. How the delivery options are categorized differ widely between the surveys. For example, PostNord et al. (2016, p. 13) define Click & Collect as when a product is ordered online and then picked up at either a collection point, the physical location of the e-shop, or a parcel locker. Barclays (2014), on the

other hand, consider Click & Collect from store as a separate option, collection point as another, and collection from a warehouse depot as a third.

A list of delivery options available today has been put together by the authors of this thesis, see Table 3.2 below. The table includes a description of how these concepts should be interpreted within this report, and whether or not it demands human interaction.

Table 3.2. Existing delivery options for e-commerce products.

<i>Delivery option</i>	<i>Description</i>	<i>Requires human interaction</i>
<i>Collection point</i>	The customer picks up the order at a collection point. Collection points are often situated near or inside a supermarket.	Yes
<i>Click & Collect</i>	The order is delivered to the physical store where the customer picks it up.	Yes
<i>Parcel Locker</i>	Lockers placed in public areas. The customer collects the order by unlocking the correct locker, using a personal pin code.	No
<i>Attended home delivery</i>	The customer chooses a delivery time slot and upon the delivery signs a receipt to confirm the receiving.	Yes
<i>Unattended home delivery</i>	The order is delivered to the mailbox or placed outside the door.	No
<i>Bike couriers</i>	Bike couriers are employed by parcel service providers to deliver parcels by bike. Bike couriers are mostly used for point-to-point delivery of documents or food.	Yes

3.3.2 Future Solutions

The future of the last mile is emerging. Parcel delivery: The future of the last mile, a report by McKinsey & Company (2016), predicts that in 2025, 80 percent of all deliveries in the world will be performed by unmanned vehicles. Customer preferences put pressure on e-commerce businesses to deliver faster and still keep

the costs retained. More about consumer preferences in Section 3.4. With the e-commerce industry growing bigger every year, the last-mile delivery, especially of parcels, has become an interesting subject for both media and investors. Jeff Bezos, CEO at Amazon, said in an interview with The Telegraph “One day Amazon delivery drones will be as common as seeing a mail truck” (Quinn 2015).

In their forecast of the development of new delivery solutions, McKinsey & Company have identified several new delivery models. Table 3.3 displays the solutions and a short description of each option. Note that there is a difference between if a self-driving vehicle requires human interaction or human supervision. Human interaction means that a human must be present inside the vehicle to do the monitoring. Human supervision, on the other hand, means that the vehicle is operating on its own, but needs to be supervised through a computer screen.

Table 3.3. Future delivery solutions identified by McKinsey & Company (2016, p. 20).

<i>Delivery solution</i>	<i>Description</i>	<i>Requires human interaction/supervision</i>
<i>Autonomous Ground Vehicles with parcel lockers</i>	A self-driving vehicle, equipped with parcel lockers, driving on regular roads. Customers are notified of the delivery time through a smartphone application. Upon arrival, the customer is asked to collect their parcel from one of the lockers on the van.	No/Yes
<i>Drones</i>	Autonomous aircrafts that take the most direct route to their destination and can fly at a relatively high speed. Today's models can carry up to five kilograms, but a load of up to 15 kilograms is predicted to be possible in the future.	No/Yes
<i>Droids</i>	Autonomous vehicles with a size slightly larger than the average parcel. They run on sidewalks and walkways and operate at a speed of 5 to 10 kilometers per hour. Due to their size they can only handle one delivery at a time.	No/Yes
<i>Crowdsourcing</i>	A network where anyone who meet the prerequisites can sign up as a driver. Any member of the network can then choose to complete a specific delivery order.	Yes/No
<i>Semi-Autonomous Ground Vehicles</i>	A self-driving vehicle that operate on its own, but requires a driver to monitor to it.	Yes/No

3.3.2.1 Pilot Projects in the Swedish Market

Although several new technologies are under development, McKinsey & Company (2016) predict that home delivery of groceries will continuously be

delivered by today's home delivery model. In contrast to this prediction, a few options to the "classic" home delivery solution for groceries have been spotted in the Swedish market.

In-Fridge Delivery

A solution specifically tailored for home delivery of groceries is the in-fridge delivery. Instead of getting your groceries delivered to your doorstep, you get the food delivered all the way to your fridge. This is a new pilot project conducted by ICA in cooperation with PostNord and Glue. The concept relies on the customer having a digital lock from Glue on their front door. The Glue lock can be locked and unlocked using a smartphone, and digital keys can be handed out to family members, friends and companies. In the pilot project, the delivery driver from PostNord receives approval in advance to enter the customer's home and is provided a digital key to do so. Instead of stopping at the doorstep, the driver enters the house and places the groceries inside the fridge. There is no need for the customer to be home for the time of delivery (ICA 2016).

In-Car Delivery

If you own a newer model of a Volvo, the option to get your groceries delivered to the trunk of your car is also available. Volvo has, in collaboration with PostNord and Mat.se, launched a service where you can choose to get your online grocery bags put in the back of your car, a so called in-car delivery. The service is built upon the Volvo On-Call service where a digital key can be used to unlock and lock the car once. The delivery procedure is similar to the in-fridge delivery process. The in-car delivery is also available for other types of products than groceries (Volvo 2015).

3.4 Consumer Preferences

In order to develop a successful delivery solution, understanding the customers and their motivations for purchasing groceries online, and how they prefer to have their groceries delivered, is critical. As the e-commerce industry has grown continually over the last years, the expectations from customers have expanded simultaneously. This challenges the companies, who must not only rise to the occasion but maintain profitable logistics processes and delivery solutions (MetaPack 2015, p. 2).

3.4.1 The Online Grocery Shopper

In the survey performed by Svensk Digital Handel (2016), previously mentioned in Section 3.2, 5 000 Swedish customers were interviewed regarding their online shopping behaviors. The results are compared to a study made by SyndicatePlus (2014), for which 250 European customers who had recently bought groceries online, have been interviewed. This, in order to find similarities, differences and typical behaviors among the Swedish and the European customers. For this study, the European customers originate from Germany, the Netherlands, France and the United Kingdom. The results from both studies show evident trends among customers, in terms of age, living situation, and what motivate and deter them to purchase groceries online (Svensk Digital Handel 2016; SyndicatePlus 2014). The social demographics, geographic demographics, purchasing behaviors, and the motivating and deterring factors for online grocery shoppers are presented in the following sections.

3.4.1.1 Social Demographics

SyndicatePlus (2014) investigated the social demographics based on the age group, education level and income level of the online grocery shoppers. The research shows that online grocery shoppers typically are high-income earners and have a higher level of education. Furthermore, for both the European and Swedish customers, the analysis of market penetration across different age groups reached to the conclusion that two groups are overrepresented; that is, Generation Y (aged 26-35) followed by Generation X (aged 36-45) (SyndicatePlus 2014, p. 5; Svensk Digital Handel 2016, p. 14). For a full view of the market penetration among different age groups, see Table 3.4.

Table 3.4. The online market penetration among different generations (SyndicatePlus 2014, p. 5; Svensk Digital Handel 2016, p. 14).

<i>Generation</i>	<i>European Customers (%)</i>	<i>Swedish Customers (%)</i>
Generation Z (age 18-25)	6	25
Generation Y (age 26-35)	13	41
Generation X (age 36-45)	12	30
Baby boomer generation (age 46-55)	8	19
The silent generation (age 56-65)	5	13
The silent generation (age 65+)	3	9

Generation Y, or “the Millennials”, are known to be the first generation to be raised with internet, computers, smartphones and social media, and have up until recently been very price sensitive. But as time passes by and the Millennials grow older, they enter financial maturity and their buying power increases. This indicates a continued development of the Millennials as strong online grocery market penetrators among different age groups (SyndicatePlus 2014, p. 13).

3.4.1.2 Geographic Demographics

As in the case with social demographics stated above, there are similarities between the European and the Swedish customers. The number of online grocery shoppers is largest in urban areas, and drops in a descending order for middle-sized cities, suburban and rural areas. For the Swedish market, over 25 percent of the customers living in urban areas have shopped groceries online at least once over the past year, nearly 20 percent in suburban areas and approximately 13 percent in rural areas. This differ a lot from shopping other products online, which is more common in rural areas but with less variance between urban and rural areas (Svensk Digital Handel 2016, p. 15), see Figure 3.2 below.

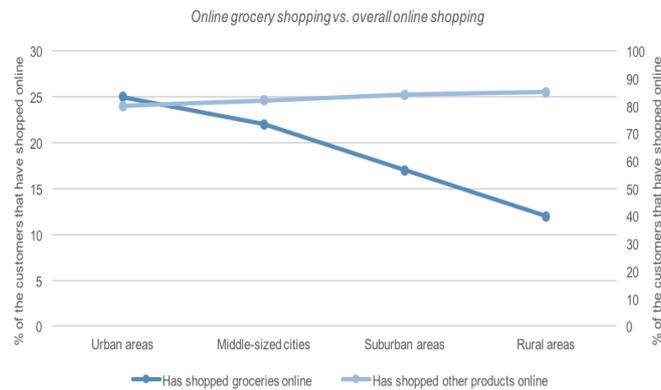


Figure 3.2. Online grocery shopping (dark blue) vs. overall online shopping (light blue) in urban areas, middle-sized cities, suburban areas, and rural areas in Sweden (replicated from Svensk Digital Handel 2016, p. 15).

Furthermore, 62 percent of the European online grocery shoppers, stated that they have ten minutes or less to nearest preferred physical grocery store. This is aligned with the fact that over half of the online grocery shoppers live in urban areas, since the distances between supermarkets tend to be shorter there than in suburban and rural areas (SyndicatePlus 2014, p. 6).

3.4.1.3 Purchasing Behaviors

The average purchase online is larger for customers that use several channels to shop their groceries. Swedish customers shopping exclusively in physical grocery stores, spend on average 698 SEK a week. Customers using several channels, that is both physical and online stores, spend as much as 1 095 SEK a week (Svensk Digital Handel 2016, p. 38). The same trend can be seen among the European customers, where the smaller purchases are more common in physical stores, and the larger purchases are more frequent online. However, the results indicate that the online customers shop less frequently than in-store grocery shoppers (SyndicatePlus 2016, p. 7). Also notable is, as stated in Section 3.4.1.1 above, that customers shopping for groceries online are high-income earners. Figure 3.3 below shows the share of online shoppers per income level. The graph confirms that the higher the earning before taxes, the higher the rate of online purchases.



Figure 3.3. Percentage of Swedish customers shopping online, based on their level of income before taxes (Svensk Digital Handel 2016, p. 38).

3.4.1.4 Motivating Factors

The motivating factors for people to shop online, and how these relate to each other, have changed over time. In the survey by Svensk Digital Handel (2016), customers are asked what they perceive as the largest benefits with shopping for groceries online. As of 2016, the benefit of having the groceries delivered to the front door, was the most frequent response from the customers. 31 percent of the shoppers perceived this as a benefit. The benefit that has shown the largest growth in response frequency among customers, from five percent in 2013 to 19 percent in 2016, is that customers get a larger assortment to choose from online than in physical stores (Svensk Digital Handel 2016, p. 19). The responses however changed when the question was rephrased to what the main reason is for the customers to shop for groceries online. The most common response, stated by 34

percent of the customers, was then the convenience (Svensk Digital Handel 2016, p. 25).

Among the European customers, 50 percent are motivated by the possibility to shop at any time they please. This is followed by 44 percent stating that the convenience of home deliveries is their primary motivation to shop groceries online. Another 37 percent value that they don't have to carry the items home themselves (SyndicatePlus 2014, p. 10). The complete answers of motivating factors for the European customers are presented in Figure 3.4 below.



Figure 3.4. Factors motivating the European shoppers to purchase groceries online. Percentage denoting the share of shoppers' responses (SyndicatePlus 2016, p. 10).

3.4.1.5 Deterring Factors

Among the Swedish shoppers, only twelve percent state that they cannot see any disadvantages with online grocery shopping. The rest of the respondents, 88 percent, find at least one disadvantage among the multiple choices in the survey. The three most frequently stated disadvantages are; the delivery cost (44 percent), the fact that customers want to inspect the food before they buy it (35 percent), and that the groceries are more expensive online than in physical stores (28 percent) (Svensk Digital Handel 2016, p. 31). Of the customers who have never shopped groceries online, 63 percent state that the reason for them deselecting online grocery shopping is that they want to be able to inspect the food before buying it. Other than that, old habits, unsuitable life or housing situations, and bad food quality are common reasons to why people hesitate to start shopping for groceries online (Svensk Digital Handel 2016, p. 21). An interesting observation is that when these customers are asked what could get them to change their view of online grocery shopping, 53 percent answer "nothing"; they are not interested in purchasing food online (Svensk Digital Handel 2016, p. 23).

In comparison to the Swedish study, there are slightly more European customers (17 percent) who cannot see any disadvantages with shopping for groceries online. A similarity can be seen in the customers' willingness to inspect the food, where

17 percent state that they prefer to touch and judge the products themselves. 20 percent confirm that they find that the grocery delivery prices are too high, and 18 percent find the home delivery time slots inconvenient (SyndicatePlus 2014, p. 11). The complete answers of deterring factors for the European customers are presented in Figure 3.5 below.



Figure 3.5. Factors deterring the European shoppers to purchase groceries online. Percentage denoting the share of shoppers' responses (SyndicatePlus 2016, p. 11).

3.4.1.6 Concluding Remarks of the Customer Attributes

The findings from the previous section, investigating the different attributes of the online grocery shopper, are summarized in the following list. The purpose of this is to contribute to the answering of the RQs and thereby help the authors to develop a new delivery solution. Additionally, the topics are first and foremost developed to help answer RQ 7.

- **Target group.** *The most important age groups to reach are Millennials (age 25-34) and Generation X (age 35-45).*
 - *People shopping for groceries online are high-income earners. The higher the income, the higher the share of online grocery shoppers.*
- **Geographical target.** *More people in urban areas have shopped for groceries online, in comparison to people living in rural areas.*
- **Scalability.** *The average purchase in online grocery stores is larger than in physical stores. The delivery solution must therefore be able to be scaled up for larger volumes.*
- **Home delivery.** *The strongest motivating factors for customers to shop groceries online are the convenience and the possibility to choose home delivery.*
- **Avoid high delivery costs.** *The most common reason to why people do not shop for groceries online is high delivery costs.*

3.4.2 Delivery Preferences

When comparing the customers' current home delivery preferences for groceries with how they would prefer their deliveries in the future, it differs. Therefore, in order to develop a successful delivery solution, it is important to both look at statistics of how people are choosing to have their groceries delivered today, and how they would prefer to have them delivered in the future. With many challenges still existing within the last-mile logistics, there is a lot of potential for suppliers to come up with innovative solutions for home deliveries. In the following sections, 3.4.2.1 and 3.4.2.2, results from surveys performed on Swedish, English, Chinese, German and American customers will be compared and evaluated. Key takeaways from the customers' delivery preferences will be presented in Section 3.4.2.3.

3.4.2.1 Current Preferences

Even though home deliveries to customers' front doors are still the most commonly used method of delivery for groceries, it has seen a decrease in usage during the last couple of years. In the study made by Svensk Digital Handel (2016), 34 percent stated that when they are given the chance to decide the delivery time slots for themselves, they chose home deliveries in 2015. The same number was lowered to 28 percent in 2016. Home deliveries, for which the suppliers set the time slots, remained at 28 percent between 2015 and 2016. During the same time, the number of customers who chose to pick up the groceries in stores themselves increased (Svensk Digital Handel 2016, p. 33).

One reason for the decreasing number of customers choosing home delivery, could be that customers are very cost conscious when it comes to selecting delivery method. Bring yearly conduct a report called *E-handelsrapporten*, that as of 2015, got over 6 000 Swedish customers who answered questions about their behaviors and opinions regarding e-commerce. The results showed that most respondents find price important when choosing delivery method; 63 percent answered that price matters (Bring 2015, p. 21). The same conclusion can be drawn from the survey performed by McKinsey & Company (2016), for which 4 700+ customers in China, Germany and the US were studied based on their preferences for different delivery options. This certifies the statement of customers being cost conscious when selecting delivery method; 70 percent of the customers stating that they choose the cheapest option when they select delivery method. Remaining 30 percent is divided between 23 percent prioritizing same day deliveries, five percent reliability, and the last two percent value instant (within two hours) deliveries (McKinsey & Company 2016, p. 9).

From the results presented in the previous paragraph, the conclusion can be drawn that price is important for the customers. How important, is however hard to conclude since different surveys and examinations show different results. One common conclusion from different investigations is that, aside from price, speed deliveries, reliability and convenience are other important factors to consider from a customer perspective. This indicates that no total pricing competition prevails in the current delivery market, but rather that different customers review the relative importance of price, in comparison to other factors, differently (Rosenström 2016, p. 16).

McKinsey & Company (2016) forecast that same-day and instant deliveries will reach a combined share of 15 percent of the investigated market by 2020, with further potential to grow more even after this date. The compelling demand for same-day and instant deliveries suggests that e-grocery players should incorporate this in their offer, ideally without charging the customers for it. The market for e-groceries is especially affected by this demand, with 27 percent of the customers stating that they have deselected to buy groceries online due to the long delivery times. This is the highest obtained percentage among the different categories investigated in the survey, concluding that fast deliveries are most relevant for groceries (McKinsey & Company 2016, p. 10), see Figure 3.6 below.

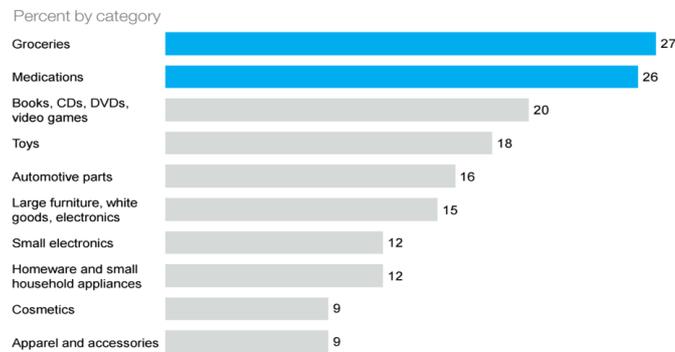


Figure 3.6. Share of respondents who did not purchase an item due to the long delivery times (McKinsey & Company 2016, p. 10).

The same trends can be seen among English customers; for a research made by Barclays (2014) with over 2 000 respondents from the United Kingdom, the challenges of the last-mile logistics are investigated. As for the Swedish customers, home delivery is the most commonly used option; 82.2 percent of the customers state that they have used home delivery via Royal Mail during the past 12 months, 71.8 percent via a courier, and another 32.7 percent via the retailer’s own van. Equivalent with the results from the studies performed by Svensk Digital

Handel (2016) and McKinsey & Company (2016), price is the most important factor for most customers when choosing a delivery option. Speed, flexibility and reputation are the second, third and fourth most important factors according to the customers (Barclays 2014, p. 10).

3.4.2.2 Future Preferences

According to the research executed by Barclays (2014), the delivery methods customers are expected to use the most in the future, will change from current behaviors. The results show that customers expect to use several of the alternatives more in the future, with the exception of delivery to neighbors and collection from the postal office, which many of the customers expect to use less. The delivery methods that are expected to grow over the next year among the English customers are presented in Table 3.5. The left column “Increase” shows the percentage of the customers that expect to use the delivery option more in the future, while the middle column “Decrease” displays the number of customers that expect to use it less. This result in a total increase that is displayed in the right column. Notable is that Barclays have performed their study on general e-commerce sales, and not groceries specifically, which could have had an impact on the outcome of the results.

Table 3.5. Percentage of customers expecting to use different delivery methods over the next year, compared to the last (Barclays 2014, p. 11).

<i>Delivery option</i>	<i>Increase</i>	<i>Decrease</i>	<i>Total</i>
<i>Click & Collect</i>	+18.5 %	-5.6 %	+12.9 %
<i>Parcel lockers</i>	+19.4 %	-9.5 %	+9.9 %
<i>Home deliveries via Royal Mail</i>	+10.0 %	-5.4 %	+4.6 %
<i>Home deliveries via a courier</i>	+10.6 %	-4.4 %	+6.2 %
<i>Home deliveries via the retailer's own van</i>	+10.0 %	-4.2 %	+5.8 %

The questioning of Swedish customers does, unlike the English survey, suggest that home deliveries will be chosen by most customers in the future (Svensk Digital Handel 2016, p. 33). This, together with a survey from JDA and Centiro (2016), that questions 2 000 Swedish customers, confirm that most Swedish customers prefer home deliveries of their groceries in the future. The number of Swedish customers that predict to be using home deliveries, parcel lockers and Click & Collect in the following years are presented in Table 3.6. The right column “Total share of customers” displays the balanced result of the two surveys.

Table 3.6. The number of Swedish customers that predict to use different options of delivery in the future (Svensk Digital Handel 2016, p. 33; JDA & Centiro 2016, p. 13).

<i>Delivery option</i>	<i>Svensk Digital Handel (5 000 Swedish customers)</i>	<i>JDA and Centiro (2 000 Swedish customers)</i>	<i>Total share of customers</i>
Home delivery	68 %	59 %	65 %
Parcel lockers	12 %	37 %	19 %
Click & Collect	4 %	32 %	12 %

The fact that customers prefer home delivery is confirmed by the results from the study by McKinsey & Company. In comparison to the parcel lockers, they conclude that as long as the delivery costs are not significantly below the regular home delivery costs, parcel lockers are unlikely to take off in the market. According to their investigation, home deliveries would have to cost 3 EUR (or approximately 30 SEK) more than the cost for a pick up at the parcel locker, in order for the customers to prefer usage of this delivery method (McKinsey & Company 2016, p. 12).

3.4.2.3 Key Takeaways

Even though differences have been identified when analyzing the results from the different surveys, some fundamental trends can be seen in all countries. The trends have been summarized in three key takeaways, displayed in Table 3.7 below. As stated in Section 3.4.2.1, different customers review the relative importance of the key takeaways differently, and it is therefore hard to state how the factors relate to each other. It should hence be noted that the key takeaways have been developed based on the response frequency among customers in the different surveys. Furthermore, the listed order of the key takeaways is not based on any mutual ranking.

Table 3.7. The key takeaways from analyzing customers' delivery preferences of groceries ordered online.

<i>Key takeaway</i>	<i>Description</i>
Willingness to pay	The majority of customers will choose the cheapest form of delivery.
Convenience	Customers want deliveries to locations they find convenient, such as home, the office, or a parcel locker at the train station.
Speed	Customers value speed deliveries, for example same-day or instant deliveries.

The first key takeaway from investigating the different studies and the customers' delivery preferences, is that the majority of customers first and foremost will base

their decision on cost. That is, if the customers are asked to only answer one aspect that affects them when deciding what delivery method to use, the majority of them will choose the cheapest form of delivery.

The second key takeaway observed, is that customers are driven by the convenience of the delivery method. As stated in Section 3.4.2.2 above, 65 percent of the Swedish customers would prefer to have the groceries delivered to their front doors (Svensk Digital Handel 2016, p. 33; JDA & Centiro 2016, p. 13). However, the convenience of the delivery method must outweigh any potential drawbacks. For example, one drawback could be that it is not always possible to individualize the delivery time slots. Many customers perceive this as a large drawback, that is not outweighed by the convenience of having the groceries delivered to the front door. This could result in customers choosing another delivery method instead. By generalizing the customers, two groups can be seen, where one is more cost conscious while the other is more willing to pay for extra services. The customers that are first and foremost driven by cost will in most cases deselect convenience if it implies a lower cost of delivery. The customers who are less cost conscious are more likely to prioritize the delivery solution that is to them the most convenient, regardless of the price. Customers have different perceptions on what a convenient delivery is, and how they value convenience when they are choosing delivery method.

The third and final key takeaway is speed; the majority of customers value speed deliveries, and would prefer same-day or instant deliveries of their groceries. However, as in the case with convenience, and as discussed in Section 3.4.2.1 above, cost is higher ranked than speed for the majority of customers. Therefore, if speed deliveries are offered, they cannot come with an extra cost for the customers. This, since there is an imminent chance that these customers will choose another delivery method instead. But, like the case of convenience, different customers value speed deliveries differently and the less cost conscious customers are, they are more likely to prioritize speed deliveries above the extra cost that the delivery solution comes with.

4 Food Product Requirements

This chapter will present requirements, in terms of temperature, security and packaging, when transporting food. Furthermore, the findings from theory, Chapter 3 and 4, are summarized in a number of key takeaways.

Guidelines have been established by Föreningen Fryst och Kyld Mat (2016) on how to handle groceries during storage and distribution. The recommendations are based on interpretations of the Swedish legislation and collective experience within the industry on how to achieve the legislation goals. The overall goal when distributing groceries is to retain the safety and quality of the food throughout the SC (Föreningen Fryst och Kyld Mat 2016, p. 6).

4.1 Temperature Requirements

During all handling, storing and transportation of chilled and frozen food, the temperature shall be kept at a level that eliminates health risks. The general rule is that that the temperature that is stated on the product packaging shall never be exceeded throughout the distribution chain, unless the legislation states otherwise (Föreningen Fryst och Kyld Mat 2016, p. 6).

To assure that the temperature requirements are fulfilled through the SC, a temperature reserve is used. A temperature reserve is the safety margin used when the food product is initially cooled or frozen. The product is put at a lower temperature than prescribed, in order to ensure that the temperature never exceeds the allowed maximum temperature during storing, picking and loading. Chilled products are more sensitive to a rise in temperature than frozen products, due to the risk of microorganism growth. How fast the product temperature increases is dependent on the size of the packaging as well as the placement on the pallet. Table 4.1 below displays the temperature requirements during transportation for different types of products.

Table 4.1. The temperature reserve, product temperature, transport temperature and accepted temporary temperature for different product types (Föreningen Fryst och Kyld Mat 2016).

Product type	Temperature Reserve	Product Temperature	Transport Temperature	Accepted Temporary Temperature
Chilled Animal Products	2 °C	+2 °C	+2 °C	+4 °C
Frozen products	Between 2 °C and 7 °C	Between -20 °C and -25 °C	-18 °C	-15 °C

There are no specific requirements for product and air temperature when it comes to chilled vegetable products. However, temperature sensitivity is the number one concern when storing fruit, vegetables and berries and must be taken into account in order to ensure the product quality.

When it comes to animal products, the temperature regulations during the distribution process are stricter than the general rules. For example, unpackaged fish must be covered in ice during transportation. Once the products reach their delivery destination, the temperature recommendation given on the packaging applies. For animal products in general, it holds that the lower the temperature, the longer the product can be stored and still keep the same quality. In Figure 4.1, the relationship between quality, time and temperature, for chilled animal products is shown (Föreningen Fryst och Kyld Mat 2016, p. 7).

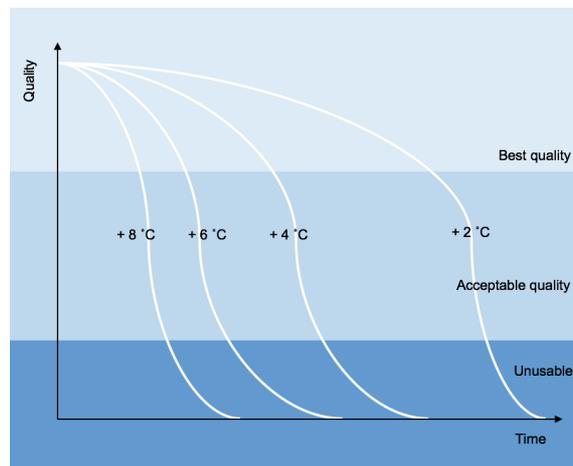


Figure 4.1. General relationship between durability and item temperature for chilled animal products (replicated from Föreningen Fryst och Kyld Mat (2016, p. 7).

4.1.1 Transporting and Storing Different Food Products Together

When different kinds of groceries are loaded and transported together, the individual temperature requirements for each food type must be fulfilled and the food quality maintained. The requirements for air temperature in areas where products are stored together, during a short period of time, must be determined by performing a Hazard Analysis and Critical Control Points (HACCP) analysis. The analysis determines the effect on groceries in different temperatures. Table 4.2 displays the time different packaging solutions can be kept outside a controlled temperature area. The air temperature shall according to Swedish legislation be measured and registered for all areas where chilled and frozen food products are stored and handled (Föreningen Fryst och Kyld Mat 2016, p. 12).

Table 4.2. Maximum handling time before the product temperature for chilled and frozen groceries are affected at a surrounding air temperature of +15 °C to +25 °C (Föreningen Fryst och Kyld Mat 2016, p. 12).

<i>Loading unit</i>	<i>Chilled groceries (minutes)</i>	<i>Frozen groceries (minutes)</i>
<i>Full-sized and half-sized pallets</i>	10	30
<i>Roller container</i>	10	20
<i>Store and large household packaging</i>	5	20
<i>SRS (Svenska Retursystem) box</i>	5	20
<i>Consumer packaging</i>	5	10

4.2 Security

When talking about security in the context of transporting and delivering food, there are several aspects to consider. The security of the goods during the actual transport, often called transport safety, refers to that the goods should reach the receiver in the same condition as it left the sender. For unattended delivery solutions, the goods must also be protected and food quality maintained, from the time of delivery until the customer picks it up.

In Sweden, around 40 million tons of food are distributed every year. The most common motor transport used to deliver the goods, both within Sweden and in Europe, are trucks. Transport safety can be violated by interruptions during the

transport because of theft or extreme weather conditions, attempts to contaminate the goods, or that natural processes decrease the food quality. The safety during transport can be divided into three main areas; 1) delivery performance, which refers to the product being delivered within a reasonable time, 2) food safety, which concerns the hygiene, and 3) prevention from intentional contamination, which is also called food defense (Livsmedelsverket 2014, p. 5).

PostNord currently delivers 80 percent of all mails and parcels that are sent, which makes them the biggest player on the Swedish mail and parcel delivery market. A lot of web shops use PostNord to deliver their consignments, and at least one well known e-grocery store uses PostNord to deliver their grocery bags. In a new report from Post- och Telestyrelsen (2017), regarding the quality of mail deliveries performed by PostNord and Bring, both companies are criticized for not delivering as promised. Complaints from customers concerning mail and parcel deliveries, have gone from 850 in 2015 to 2520 during 2016, which is an increase of 197 percent. The complaints regard mail not being delivered at all, delayed, or delivered to the wrong address. According to statistics from PostNord (2017), in total 1666 consignments disappeared during January 2017, which includes regular mail and parcels, and corresponds to less than one percent of all consignments sent during that month.

There are no documented reasons of what happens to the consignments that go missing, but one possible reason is theft. During 2015, theft and burglary accounted for 35 percent of all reported crimes in Sweden according to Brottsförebyggande rådet (2016). This makes it the most common category of crime. Both Linas Matkasse and Middagsfrid, two major players on the e-grocery market, state on their websites that if the customer is not home by the time of the delivery, the bag will be left outside the front door (Linas Matkasse n.d.; Middagsfrid n.d.). An unattended grocery bag can be considered an easy target for a thief.

4.3 Packaging

When transporting groceries, it is important to make sure that the food safety is maintained. This is mainly done by keeping the products in suitable packaging and ensure that they are kept in the correct temperature. The primary packaging for food products must ensure the food safety. This by establishing that the material used in the packaging do not transfer to the product in a way that constitutes a

health risk, lead to an unacceptable change in composition of the food, and do not change the taste or smell of the product (Livsmedelsföretagen & Normpack 2011, p. 3).

Hazard analysis are done to verify that the food quality is maintained throughout the SC. In hazard analysis the hazards are divided into four categories; microbiological, physical, allergen and chemical. When a food product is affected by undesired bacteria it is called a microbiological hazard. All food has bacteria in them, where some bacteria are supposed to be there while others are not. It is important to take precautionary action to avoid undesired bacteria contaminating the food (Livsmedelsverket 2015, p. 5). Microbiological hazard arises when chilled or frozen products are kept in a temperature that is too high. Physical hazard can occur if loose objects in the cargo space damage the products, for example if a product is contaminated with broken glass. Broken packaging can make allergens spread to other products and thereby cause an allergen hazard. Chemical hazard, when the food is contaminated by chemical substances, is often caused by intentional contamination.

Before transportation, it is important to prepare the transport vehicle and make sure that it is properly cleaned. Good delivery routines are also necessary in order to avoid damage to the product packaging and thereby risk microbiological, physical and allergen hazards (Livsmedelsverket 2015, p. 30). Unpackaged food products, like vegetables, fruit and fresh fish, should be handled with extra caution. Common deficiencies when handling unpackaged food are related to poor hygiene, such as unwashed hands, packaging done by staff carrying an infection, or products being stored together in an unorganized way (Livsmedelsverket 2015, p. 6).

4.3.1 Transporting Small Cargo

Transporting small cargo and performing Less-Than-Truckload (LTL) deliveries is a large source to inefficiencies in the last-mile logistics. The most damaging effects of this are environmental pollution and traffic jam, primarily in urban settings (Nguyen, Lau & Kumar 2015, p. 57). Some of the suppliers use paper bags to deliver their prepacked grocery bags. Due to the perishable nature and varying shapes of the packaging, this implies major challenges to stack the goods on top of each other. From a logistics perspective this means a lot of half empty trucks, if the trucks are not customized to deliver grocery bags. This could be costly, since shipping a half empty truck more or less will incur the same cost as

driving a full truck (Transporteca 2017). In order to optimize the truck load of small cargo, the truck must be equipped with shelves, wagons or something similar to increase the fill rate of the truck (Hosseini & Shirani 2011, p. 68). If not, the grocery bags can only be loaded on the truck floor.

4.4 Findings from Theory

The content in Chapter 3 cover concepts and theory within the fields of distribution, the Swedish market for e-groceries, the existing online delivery solutions, and consumer preferences. This, together with the food requirements presented in this chapter, are concretized into 14 key takeaways, that are listed below.

- **Transportation costs.** In a market with low-value products, transportation costs associated with the delivery to the end-customer, have a big influence on competitiveness.
- **SST.** Enables the customer to decide when to pick up their groceries, which increases customer satisfaction.
- **Competitive market with small margins.** The Swedish e-grocery market has many players and small profit margins.
- **Competitive advantage.** Competitive advantage in the e-grocery market is gained by cost effective purchasing and logistics strategies.
- **Demand for new delivery solutions.** None of the existing delivery solutions manage to optimize both customer satisfaction and cost effectiveness for the provider.
- **New technology needs to be further developed.** The new technology and delivery solutions that is emerging still needs to be further developed before they can be implemented on the Swedish market.
- **New technology not suitable for grocery deliveries.** Many new delivery solutions are under development; however, they might not be suitable for grocery deliveries but rather other types of products of less sensitive nature.
- **Willingness to pay.** The majority of customers will choose the cheapest form of delivery.
- **Convenience.** Customers want deliveries to locations they find convenient, such as home, the office or a parcel locker on the train station.

- **Speed.** Customers value speed deliveries, for example same-day or instant deliveries.
- **Managing the cold chain and the different temperature requirements** is the single most challenging and critical part of delivering groceries.
- **Protection against theft.** An unattended delivery solution requires protection against theft.
- **Risk of contamination.** If the groceries are to be left unattended outside of peoples' homes, there is always a risk that the food will be contaminated.
- **Secondary packaging critical.** From a logistics perspective the secondary packaging is critical, since its level of stackability has a direct effect on the vehicle fill rate.

5 Findings

This chapter presents the findings from the case study. An empirical data collection is completed, for which the results from interviews and observations are presented. The interviews are summarized in a number of key takeaways, that are persistent among the interviewees.

5.1 Findings from Case Study

A case study is performed and the findings are collected through an empirical data selection at Nowaste, logistics providers, online grocers, and other organizations. The following sections will present the findings from the interviews and observations.

5.1.1 Interviews

The purpose of the interviews is to ask the interviewees about the existing challenges of transporting chilled food in the last-mile logistics. The overall outcome shows that the largest challenges lie in the perishable nature of food, the cold chain, the different temperature requirements, and the fact that the customers demand small volumes and fast deliveries. This challenges the need for large volumes during transportation, required in order to gain profits through economies of scale. As source of origin, the data collected in the interviews are referred to as “Nowaste employees”, “Logistics providers”, “Online grocers” and “Other organizations”, listed as verbal sources in the reference list.

5.1.1.1 Interviews at Nowaste

In total five interviews are performed with Nowaste employees. The main areas covered in the interviews are the current operations and business development, how food is packaged during transportation, and their view on home deliveries and what could be done to improve the performance in the last-mile logistics. Finally,

the interviews performed at Nowaste are summarized in twelve key takeaways, that are concluded from all of the five interviews.

Current Operations and Business Development

The company is offering third party logistics and warehouse management solutions specialized to suit companies that value highly automated solutions and short lead times. Nowaste are tech-savvy, and are operating a partly automated warehouse with robots and conveyor systems. Other than that, they have developed their own Warehouse Management System (WMS), called Effect Warehouse. The operations include both terminal management and transport. The company is not currently operating its own vehicle fleet, but is contracting forwarding and spedition companies to be able to offer its customers transport solutions. Nowaste are not defining themselves to any specific industries, but are targeting companies for which logistics are a large part of the company's success (Nowaste employees 2017).

Other than operating logistics services, Nowaste offer consultancy services for companies with a need to increase their logistics knowledge and improve the operations. This service is not a core business, but rather a strategic matter and a course of action in order to contract new customers. The goal is to become Sweden's leading logistics company by focusing on high productivity and well-educated staff. Top management support and spend a lot of resources to further educate the staff in new activities and encourage them to take more responsibility within the company. Many of the employees on management level have started their career at Nowaste as a picker, and have then grown within the company since they got the opportunity for education and to develop from the warehouse floor. The company's ambition is to continue to grow, which is also one of the reasons to why the company has decided to look into home deliveries of food. Reaching the final customers is considered to be an important next step for the company to take (Nowaste employees 2017).

Food Packaging and Temperatures

The food distributed by Nowaste can be divided into four different product groups; 1) Fresh fruit and vegetables, 2) Chef's cut (ready-chopped vegetables for restaurants and caterers), 3) Atria (meat products), and 4) Ready-cooked meals. Depending on what product group a food product belongs to, and more specifically what kind of product it is, it is packaged differently (Nowaste employees 2017). Some examples for the different product groups and the primary and secondary packaging used during storing and transportation are presented in Table 5.1 below.

Table 5.1. Product examples for the four different product groups and how these are packaged during storage and transportation (Nowaste employees 2017).

Product Group	Product Examples	Primary Packaging	Secondary Packaging
1) Fresh fruit and vegetables	Cucumber, tomatoes, bananas etc.	None	SRS- or cardboard boxes
2) Chef's cut	Ready chopped carrots, lettuce etc.	Sealed- or vacuum-packed	Cardboard boxes
3) Atria	Meat products, ham, sausage, salami etc.	All types of packaging; plastic, glass etc. For some products; none	SRS- or cardboard boxes
4) Ready-cooked meals	Ready-cooked meals	Plastic tray, sealed with plastic film	Cardboard boxes

One of the largest challenges with transporting mixed product groups is the different temperature requirements (Nowaste employees 2017). Even products within the same product group can have different temperature requirements. As mentioned in Chapter 4, it is the temperature sensitivity that determines in what temperature the products should be transported. However, to make the transports more efficient, products with different temperature requirements are sometimes transported together. In that case, a common temperature is used in order serve the needs for all products in the best way possible. Table 5.2 gives some examples of the optimal temperature and the actual temperature used during transportation according to the Nowaste employees. The reason why the used transport temperature do not always match the optimal temperature is that the products transported together have different temperature requirements. The company is currently testing how the product qualities are affected if one common temperature at +6 °C were to be used for the different product groups. This would facilitate the planning of transports and would improve the vehicle fill rates (Nowaste employees 2017).

Table 5.2. Optimal and Used Transportation Temperature for different products (Nowaste employees 2017).

<i>Product Group</i>	<i>Product Examples</i>	<i>Optimal Temperature</i>	<i>Used Transport Temperature</i>
1) Fresh fruits and vegetables	Most fruits and vegetables	Between 0 °C and +7 °C	Between +8 °C and +10 °C
1) Fresh fruits and vegetables	Bananas	+15 °C	Between 8 °C and +10 °C
2) Chef's cut	Ready chopped carrots, lettuce etc.	+4 °C	+4 °C
3) Atria	Meat products, ham, sausage, salami etc.	+4 °C	+4 °C
4) Ready-cooked meals	Ready-cooked meals	+4 °C	+4 °C

Home Deliveries

The challenges that currently exist in cold chains do not only affect the transport, but also the delivery. Among other product categories, it can sometimes be agreed that the package should be dropped off, at for example the driveway, if the customer is not home in time for delivery. Even if the risk of theft is ignored, this is not recommended for groceries since the food will be destroyed if it is left in the wrong temperature for too long. This means that the customers currently must be given time windows when they need to be home to receive their deliveries. However, in case the customer is not home when the driver arrives, some drivers would go an extra round only to deliver to that specific customer later during the route. This creates extra stops and additional costs to the delivery routes. Furthermore, in the current situation with many stops and small volumes, home deliveries are hard to make cost effective (Nowaste employees 2017).

The Nowaste employees have a fairly mutual view of parameters that could make home delivery more effective. The ideal delivery solution according to the interviewees would enable for an interface between the goods owners, logistics providers, and the final customers. The goal for an interface solution would be to simplify for customers to make orders directly to their doorsteps, without the need to be home in order to receive the goods, and with the possibility to make returns as well. An important aspect to note from this is the simplicity. If a new delivery concept are developed, it must imply that it becomes easier for customers to make an order online and choose home delivery, than it is to drive and buy the groceries in a physical store themselves (Nowaste employees 2017).

If a solution were to be developed successfully, with a big network of users ordering large volumes, the goods owners and logistics providers would also benefit from the delivery solution. This, because of the opportunity to be able to plan the routes without regard to time windows, which would create larger volumes per route and potentially also a higher number of deliveries per stop. Some of the interviewees also point out the importance of the concept to be operating independently, with no stakeholders among goods owners or logistics providers. That would imply that all goods owners and logistics providers could use the solution to perform deliveries. Hence, Nowaste do not perceive this opportunity as a potential competitive advantage towards other logistics providers, but rather a stand-alone project. This, since they currently have not seen any home delivery solutions on the market that meet their requirements on performance (Nowaste employees 2017).

Key Takeaways

The data collected at Nowaste are summarized in twelve key takeaways that one or several interviewees have stated during the interviews. The key takeaways focus on aspects relevant to the last-mile logistics and the development of a new delivery concept. They are an identification of inefficiencies and current issues associated with home deliveries in general, and home deliveries of groceries in particular. Furthermore, they identify desired characteristics for a new delivery solution. The aim of the twelve key takeaways is to contribute to the development of a new delivery system, and to concretize the core essence of the interviewees' responses.

- **Volume** is needed in order to perform cost effective last-mile deliveries.
- **Cost effectiveness.** It is currently hard for companies to make profit of their e-grocery sales. Home deliveries are costly to perform and the customers are not prepared to pay for the actual costs.
- **Time spent per delivery** will be crucial to minimize in order to achieve cost effectiveness.
- **Speed deliveries.** Customers within the e-commerce industry wants shorter and shorter lead times, from ordering the products online until time of delivery.
- **Unattended delivery:** the customers should not have to be home to receive their groceries. On long term, it is not viable to individualize all deliveries.
- **Small volumes** are the new standard that comes with last-mile logistics, which challenges the traditional B2B, bulk deliveries.

- **Higher demands on logistics providers and their drivers**, who must be able to handle not only port-to-port deliveries, but all challenges that comes with last-mile logistics.
- **Managing the cold chain and the different temperature requirements** is the single most challenging and critical part of delivering groceries.
- **Simplicity**: it must be simple for both customers and logistics providers to use the delivery solution.
- **Freedom to choose**: it must be possible for customers to choose what delivery option that suits them best.
- **The solution must be flexible** in terms of size and adaptability to different product requirements.
- **The solution must perform independently** with no stakeholders among goods owners and logistics providers; all must be able to use it for delivery to their customers.

5.1.1.2 Interviews at Logistics Providers

Three interviews are performed at the logistics providers DB Schenker, Bring and Rolf Viebkes Åkeri. The topics included are standards for transporting food and the interviewees' view on home deliveries. The interview notes are reviewed by the authors and twelve key takeaways summarize the interview topics.

Food packaging and Temperatures

All of the interviewed logistics providers are offering food transports to their customers. However, DB Schenker in Helsingborg are currently not performing home deliveries of groceries, but Bring and Rolf Viebke do. A review of the logistics providers' offers to their customers, in terms of food transports, is presented in Table 5.3.

Table 5.3. The logistics providers' offers for food transportation (Logistics providers 2017).

Company	Home Deliveries of Groceries	Secondary Packaging	Temperature	Offer Home Deliveries of Frozen Food
DB Schenker	No	SRS- and cardboard boxes	Between +6 °C and +8 °C	-
Bring	Yes	SRS-, cardboard or Styrofoam boxes, roller containers etc.	Between +2 °C and +8 °C	Yes, in freezer boxes (electricity or dry ice)
Rolf Viebkes Åkeri	Yes	SRS- and cardboard boxes	+3 °C	Yes, in freezer bags (dry ice)

To note is that several of the interviewees state that there is no general rule for how the food should be transported. It rather varies from customer to customer based on their product requirements, in terms of packaging, truck temperatures, and whether or not to use different temperature zones in the trucks (Logistics providers 2017).

Rolf Viebkes Åkeri perform home deliveries for Bergendahlsgruppen (CityGross) and Coop. The different offers for these two customers vary widely. CityGross package their home deliveries in cardboard boxes and they are currently not selling frozen food online. Hence no separation of refrigerated and frozen food is needed during transportation. Coop's home deliveries are first packaged in plastic or paper bags, and then put in SRS boxes for transportation. Coop sells frozen food online, which must therefore be separated from the refrigerated food for storage. The interviewee points out one critical difference between these two concepts; CityGross has a one-way flow of secondary packaging while Coop depend on a well-functioning return flow of SRS boxes and freezer bags, which from a logistics perspective adds complexity to the system (Logistics providers 2017).

Home Deliveries

When it comes to home deliveries, and the last-mile logistics for food in particular, the different interviewees focus on different issues and challenges. This, very likely due to the fact that they provide different logistics offers to their customers within the food industry, and therefore have different views on what aspects of the last mile that are the most challenging. The different challenges viewed by the logistics providers can be grouped together in three themes; customer availability, small volumes and a preserved cold chain. The challenges with corresponding problem descriptions are presented in Table 5.4.

Table 5.4. The existing challenges when performing home deliveries according to the logistics providers (2017).

<i>Challenges</i>	<i>Problem Description</i>
Customer availability	<ul style="list-style-type: none"> • There is an existing need of time windows, which are hard to schedule in order to get the system to run smoothly. • Contradiction between the need of time windows and the customers' unwillingness of being home just to receive their groceries.
Small volumes	<ul style="list-style-type: none"> • Large challenge due to the high costs in terms of labor, fuel, vehicle amortizations etc. • Small volumes when performing home deliveries result in high costs per delivered kilo.
Preserved cold chain	<ul style="list-style-type: none"> • The single most important parameter when delivering food is to maintain high quality throughout the SC. • For food, high quality is primarily maintained through a preserved cold chain.

Other than the aspects covered in Table 5.4, the logistics providers embrace the importance of how the customers experience the delivery; how the groceries are displayed and that no goods are damaged. That means that the logistics providers could not only emphasize the preservation of the cold chain, but also how the groceries are presented at the time of delivery. Regarding the customer availability and small volumes the interviewees agree on, that it from a logistics perspective would be great to be able to make unattended deliveries (Logistics providers 2017).

Key Takeaways

The interviews at the logistics providers are summarized in twelve key takeaways. Out of these twelve, nine key takeaways are the same as in the case of Nowaste Logistics. As mentioned in the previous section, the key takeaways focus on aspects relevant to the last-mile logistics, and are developed to help the authors concretize the core essence of the interviewees' responses.

- **Risk of contamination.** *If the groceries are to be left unattended outside of peoples' homes, there is always a risk that the food will be contaminated.*
- **Expanded offers.** *The limit for logistics providers and what they are able to offer their customers continuously stretches. This goes from the loading at terminals to the unloading stage at customer sites.*
- **Volume is needed in order to perform cost effective last-mile deliveries.**

- **Cost effectiveness.** *It is currently hard for companies to make profit of their e-grocery sales. Home deliveries are costly to perform and the customers are not prepared to pay for the actual costs.*
- **Unattended delivery.** *The customers should not have to be home to receive their groceries. On long term, it is not viable to individualize all deliveries.*
- **Protection against theft.** *An unattended delivery solution requires protection against theft.*
- **Small volumes** *are the new standard that comes with last-mile logistics, which challenges the traditional B2B, bulk deliveries.*
- **Speed deliveries.** *Customers within the e-commerce industry wants shorter and shorter lead times, from ordering the products online until time of delivery.*
- **Higher demands on logistics providers and their drivers,** *who must be able to handle not only port-to-port deliveries, but all challenges that comes with last-mile logistics.*
- **Managing the cold chain and the different temperature requirements** *is the single most challenging and critical part of delivering groceries.*
- **Freedom to choose:** *it must be possible for customers to choose what delivery option that suits them best.*
- **The solution must perform independently** *with no stakeholders among goods owners and logistics providers; all must be able to use it for delivery to their customers.*

5.1.1.3 Interviews at Online Grocers

Two phone interviews and one written interview are held with employees at companies offering grocery sales online and home deliveries. Two of the interviewees are employed at ICA stores that both have physical grocery stores and online stores, offering loose goods and a selection of prepacked bags. In addition to the interviews, observations of the home delivery process in these stores have been made, read more about this in Section 5.1.2.1. The third interviewee works at MatHem, an online grocery store that offers both loose good and prepacked bags. The main subjects covered in these interviews are the supply and demand for the online grocery market and home deliveries. The interviews are summarized in five key takeaways that are concluded from the three interviews.

Supply and Demand

The sales volumes when it comes to online sales differ a lot between the three companies in the interviews, as can be seen in Table 5.5 below. Note that the two

ICA stores only operate in Lund and its surroundings while MatHem covers several geographical areas throughout Sweden. For MatHem all the revenue comes from online sales, while it for the ICA stores only answers for a part of their revenue (Online grocers 2017).

Table 5.5. Total revenue 2015 for the three interviewed online grocers (allabolag 2017a; allabolag 2017b; allabolag 2017c).

<i>Company</i>	<i>Total revenue 2015 (MSEK)</i>
MatHem	735
ICA Mobilia Lund	175
ICA Södra Sandby	180

All three of the interviewees state that loose goods answer for the biggest part of their online sales and the trends suggest that it is growing even more. They also agree that loose goods are costlier than prepacked bags. A reason for this is that the bags with loose goods are harder to mass-produce since they all are packaged with different content. One of the interviewees state that the volume of the loose goods purchases online are significantly larger than the average in-store purchase. The average online order costs 1200 SEK while the corresponding amount from the store check out is 200 SEK (Online grocers 2017).

One of the stores state that the demand from their online store vary a lot and that it is hard to anticipate the number of orders from one day to another. This in turn makes it difficult to know how to schedule the personnel. Another interviewee attest that this is not a concern for them, since their online sales volumes are relatively large. The variations in demand do not affect the number of personnel needed but it can affect the workload (Online grocers 2017).

Home Deliveries

The online grocery store, MatHem, delivers the orders through home delivery or pick up points. The physical stores offer other delivery options for their online customers. One of the stores has a Drive Thru where the customers do not even have to leave their car to pick up their groceries. The other store has refrigerated parcel lockers accessible from the parking lot where the customers can pick up their orders. For one of the stores, 70 percent of their online sales are delivered home to the customer which adds up to between 35 and 61 home deliveries per day. The corresponding number for the other store is ten percent which is between 1 to 5 deliveries per day. Most of their online sales are instead delivered through the parcel lockers. Two of the interviewed companies handles the home deliveries by themselves while the third has hired a courier company to deliver for them. The store that hires a courier company to handle their home deliveries used to own a

van to perform their own deliveries. However, when their volumes increased they found that it was too much work to do it all themselves. Even if it is costlier to hire a third party, the benefits of a smaller workload are deemed to be of greater value. All of them use refrigerated vans to handle the deliveries. One company use vans that are divided into one refrigerated and one frozen area (Online grocers 2017).

When the customers choose the home delivery option, they also choose a time slot for when they want their delivery. Both of the stores have two-hour time slots for their home deliveries, while the online grocery store has time slots of varying length, between one and four hours. The online grocery store has recently started with same day deliveries, meaning if the order is made before 13.00 the delivery can be performed the same day. Both of the stores require the order to be made at the latest 23.59 the day before in order to deliver during the following day. The length of the time slots is chosen to try to accommodate the customer in the best way possible and still keep the logistics as efficient as possible. Two of the suppliers limit the number of customers that can choose home delivery in a certain time slot. The third, who uses a courier to make their deliveries, has no such limitation (Online grocers 2017).

The companies use different approaches for handling the event of the customer not being home. All of the companies first try to call the customer, and depending on if the customer answers or not, the companies take different actions. If the customer answers, they all give the customer the chance to decide what will happen with the bag; if it should be left outside the door or if the driver should bring it back to the warehouse. However, if the customer do not answer, two of the companies bring the order back with them, where one of them tries to return later, and the third leaves the bag outside the front door (Online grocers 2017).

Home deliveries are costly for the providers. If the deliveries are handled in-house, the costs include personnel wages, fuel and reparations for the delivery vehicles. If the home deliveries are performed by a third party there is a fixed price for every route. It is hard to get the revenue from the customers to cover all the costs associated with home deliveries. The home delivery fee is usually not enough to cover all the expenses. One of the stores therefore take a higher price for the products online than in-store in order to cover the costs (Online grocers 2017).

Key takeaways

The three interviews performed at the online grocers are summarized in five key takeaways, see the following list. Note that of the five key takeaways, four of them are the same as the topics concluded from the interviews at Nowaste, and three are repeated from the logistics providers key takeaways.

- **Volume** is needed in order to perform cost effective last-mile deliveries.
- **Cost effectiveness.** It is currently hard for companies to make profit of their e-grocery sales. Home deliveries are costly to perform and the customers are not prepared to pay for the actual costs.
- **Time spent per delivery** will be crucial to minimize in order to achieve cost effectiveness.
- **Speed deliveries.** Customers within the e-commerce industry wants shorter and shorter lead times, from ordering the products online until time of delivery.
- **Compete with price.** The grocery industry competes with pricing which makes it hard to charge enough to cover the additional costs that home deliveries bring and still be competitive.

5.1.1.4 Interviews at Other Organizations

Another two interviews are performed outside of Nowaste's organization. These organizations can be seen as independent, with good insights in the food industry, but with no own business operating transports or home deliveries. However, the representatives have good insights in the specific requirements of fresh food, and can provide the authors with knowledge in how to translate these requirements into demands for the delivery solution. The main area covered during the interviews is the interviewees' view on home deliveries and what could be done to better fulfill the food requirements during storing and transportation. The interviews are summarized in eight key takeaways.

Home Deliveries

Both of the interviewees share the opinion that the concept with home delivery of groceries started years ago but, at that time, the market was not ready. The interviewee based in Stockholm gives an example of a company that already 20 years ago performed home deliveries of groceries, but had to stop due to prematurity in the market. The other interviewee brings up a company from the southern part of Sweden with a similar story that occurred ten years ago. However, they both agree that the market for online groceries today are on the rise, and is here to stay (Other organizations 2017).

When asked about what trends they have seen in online grocery business lately, they both mention local businesses and producers trying to reach the customers directly. That is, producers with organic and locally produced products using home deliveries or pick up locations to deliver to customers in their vicinity. They experience an increasing demand for "high quality" food delivered directly from the local producers without intermediates (Other organizations 2017).

One of the interviewees experience that the customer expectations for home deliveries have increased along with the whole online market growing. Furthermore, she points out that “People get frustrated when they order something and the only delivery option is Monday between 9 -13. They can’t believe it. Then they feel like they might as well drive to the store themselves to pick it up rather than having their whole morning blocked”. Even a two-hour delivery interval is suggested to be too long. Time windows prevent the customers from spontaneous activities, and even a small unexpected event can make customers miss their deliveries. The other interviewee does not entirely share this opinion. She agrees that the customer is tied up during the delivery window. However, she deems this to be a small sacrifice on the customer's behalf compared to the convenience that a home delivery brings (Other organizations 2017).

The interviewees share the common view that the most important requirement for an unattended delivery solution is that it needs to be able to keep a low temperature for products that need to be refrigerated. The quality of the food must stay intact until the customer comes home. One of the interviewees also emphasizes the importance that the delivery solution prevents theft. The other interviewee, on the other hand, deems this risk to be low and therefore not as important (Other organizations 2017).

Key Takeaways

The key takeaways from the other organizations are summarized in eight topics, see the list below. Three of them are repeated from the Nowaste employees key takeaways, and the same three are mentioned among the logistics providers. Only one of the key takeaways below are identical with a key takeaway from the online grocers.

- **Freedom to choose:** it must be possible for customers to choose what delivery option that suits them best.
- **Cost effectiveness.** It is currently hard for companies to make profit of their e-grocery sales. Home deliveries are costly to perform and the customers are not prepared to pay for the actual costs.
- **The solution must perform independently** with no stakeholders among goods owners and logistics providers; all must be able to use it for delivery to their customers.
- **Speed deliveries.** Customers within the e-commerce industry wants shorter and shorter lead times, from ordering the products online until time of delivery.

- **Managing the cold chain and the different temperature requirements** is the single most challenging and critical part of delivering groceries.
- **Food quality.** The delivered food must keep a high quality and the quality must not be affected during the delivery.
- **Niched deliveries.** A trend in the online grocery market is producers performing home deliveries or offering pick up directly to the customers in the vicinity.
- **Protection against theft.** An unattended delivery solution requires protection against theft.

5.1.1.5 Summary of Key Takeaways

The key takeaways from the previous sections, concluded from the data collected during the interviews at Nowaste, the logistics providers, online grocers, and the other organizations, are summarized in 18 key takeaways. This can therefore be seen as a concluding list of outcomes from the interview study. The themes are ranked in a descending order based on how many times the key takeaway recur. After each takeaway it is specified how many times it has been repeated in the previous chapters.

1. **Cost effectiveness.** *It is currently hard for companies to make profit of their e-grocery sales. Home deliveries are costly to perform and the customers are not prepared to pay for the actual costs. (4)*
2. **Speed deliveries.** *Customers within the e-commerce industry wants shorter and shorter lead times, from ordering the products online until time of delivery. (4)*
3. **Volume** *is needed in order to perform cost effective last-mile deliveries. (3)*
4. **Freedom to choose:** *it must be possible for customers to choose what delivery option that suits them best. (3)*
5. **The solution must perform independently** *with no stakeholders among goods owners and logistics providers; all must be able to use it for delivery to their customers. (3)*
6. **Managing the cold chain and the different temperature requirements** *is the single most challenging and critical part of delivering groceries. (3)*
7. **Time spent per delivery** *will be crucial to minimize in order to achieve cost effectiveness. (2)*
8. **Small volumes** *are the new standard that comes with last-mile logistics, which challenges the traditional B2B, bulk deliveries. (2)*

9. **Higher demands on logistics providers and their drivers**, *who must be able to handle not only port-to-port deliveries, but all challenges that comes with last-mile logistics. (2)*
10. **Unattended delivery**: *the customers should not have to be home to receive their groceries. On long term, it is not viable to individualize all deliveries. (2)*
11. **Protection against theft**. *An unattended delivery solution requires protection against theft. (2)*
12. **Simplicity**: *it must be simple for both customers and logistics providers to use the delivery solution. (1)*
13. **The solution must be flexible** *in terms of size and adaptability to different product requirements. (1)*
14. **Risk of contamination**. *If the groceries are to be left unattended outside of peoples' homes, there is always a risk that the food will be contaminated. (1)*
15. **Expanded offers**. *The limit for logistics providers and what they are able to offer their customers continuously stretches. This goes from the loading at terminals to the unloading stage at customer sites. (1)*
16. **Compete with price**. *The grocery industry competes with pricing which makes it hard to charge enough to cover the additional costs that home deliveries bring and still be competitive. (1)*
17. **Food quality**. *The delivered food must keep a high quality and the quality must not be affected during the delivery. (1)*
18. **Niched deliveries**. *A trend in the online grocery market is producers performing home deliveries or offering pick up directly to the customers in the vicinity. (1)*

5.1.1.6 Factors Affecting the Delivery Solution

This section presents the results from the quantitative data gathering during the interviews. For the first question, seven out of ten respondents give the same answer to what factor that is of highest importance when developing a new delivery concept. That is, the possibility for customers to pick up their groceries at any time during the day, whenever it suits them the best. The remaining three interviewees respond ease of route planning, optimized vehicle fill rate, and adaptability to be of highest importance. Figure 5.1 below visualizes the response distribution for the attributes that the interviewees have rated the highest for the first question. To note is that no one of the respondents answer security or scalability to be of highest importance when developing a new delivery concept.

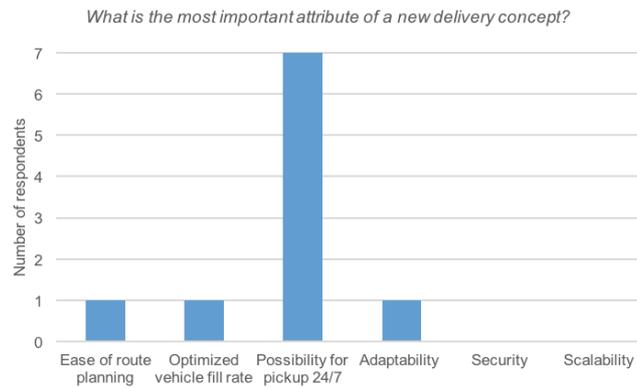


Figure 5.1. The response distribution of the attributes that the respondents have rated to be of highest importance to the delivery concept.

When it comes to the second question, and what the interviewees answer to be most important to consider from a customer perspective, the results show that five out of ten believe convenience to be most important. Four out of ten perceive cost to be the most essential for customers when choosing delivery option. One person trusts in speed to be the deal breaker for customers. The chart in Figure 5.2 below displays the distribution among the attributes that are rated to be of highest importance to customers when choosing delivery option. Several of the respondents who answers that convenience is of highest importance, points out that this is based on their view on what will motivate customers to choose a delivery option. They mean that it would probably be the convenience rather than the lowest price that determines what delivery solution customers will choose.

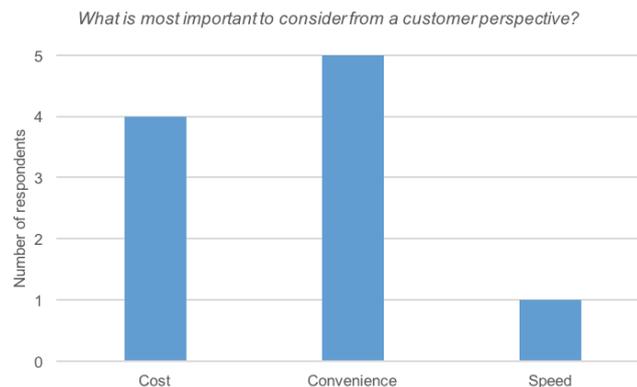


Figure 5.2. The response distribution of the attributes that the respondents have rated to be of highest importance to the customers.

Out of the four interviewees at Nowaste that are asked to rate the importance of cost, a short implementation process, available technology and uniqueness, three

answers that cost is of highest importance when implementing a new delivery concept. The last person answers that uniqueness is of greatest importance. An interesting observation to make is that the same person answers cost to be of the lowest importance. In Figure 5.3 the highest rated factors are visualized. A full review of all the interviewees' ratings for the three questions are presented in Appendix I.

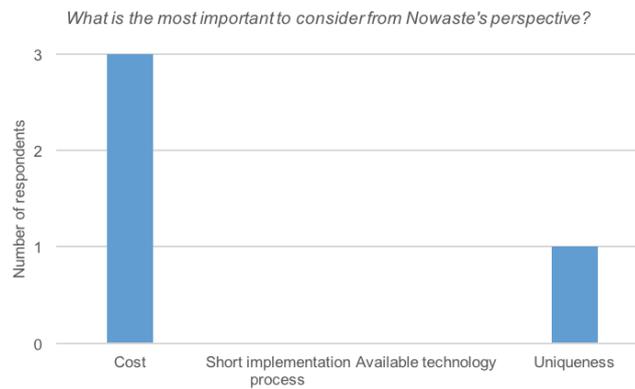


Figure 5.3. The response distribution of the attributes that the respondents have rated to be of highest importance to Nowaste Logistics.

5.1.2 Observations

The data collection is finalized by the completion of four observations. One observation is performed at Nowaste and the other three outside the case study company. The findings from the observation at Nowaste are displayed in Appendix J. The external observations are performed at ICA Södra Sandby, ICA Mobilia Lund and Budmäster. Two of these external observations, ICA Mobilia Lund and Budmäster, are referred to as one joint observation, since they are performed concurrently during the same day.

5.1.2.1 External Observations

As a part of this master thesis, observations at two ICA stores, covering their home delivery routines, are carried out in order to gain better insight in how home delivery of groceries are performed today. The first observation is made at ICA Södra Sandby and are here referred to as *Observation 1*. The second observation are made at ICA Mobilia Lund and are here mentioned as *Observation 2*. This observation include the observation performed in cooperation with Budmäster. Both of the observed stores operate in Lund and its surrounding areas.

The Online Ordering Process

When a customer browse into ICA online they arrive at the starting page. The starting page provides the visitor with several options. Among these, continuing to grocery shopping in the online store is one, and to the selection of prepacked bags is another one. When clicking into one of those options, the customer is asked to enter their postal code and is then presented with a list of stores available in the area for either in-store pick up or home delivery. Once the customer has chosen which store they prefer to shop from, it is time to start the actual shopping.

The online grocery store allows the customer to pick items from a wide selection of groceries, and place them in a virtual shopping cart. To find an item, the customer can either type in a word in the search bar or choose a category in the menu. Once the customer is satisfied with the shopping, they proceed to checkout and payment. At this stage, the customer also chooses a time for delivery or pickup. In *Observation 2*, the timeslots for home delivery are two hours long, while the timeslots for the Drive Thru are four hours long. However, that not all timeslots are available for all customers. In *Observation 1*, the delivery time slot and the pickup time slot are both two hours long, and all timeslots are available for all customers. Furthermore, only a certain number of customers can choose delivery within a certain time slot. The store in *Observation 1* has no Drive Thru service, but if in-store pick up is chosen the bags are placed in cooled parcel lockers, easily accessible from the store parking lot. In both stores, the in-store pickup option is free of charge while the home delivery option comes with a delivery cost.

The prepacked bags come in four different themes, family, vego, bistro and inspiration, and contains ingredients for several dinners. The customers are given a choice of how many dinners the bag shall contain, between three and five. The customer can also choose the number of people the bag shall serve, between two and six. The options available vary depending on the theme of the bag. The

prepacked bags can be ordered once, or as a subscription on a weekly basis. Once the customer has chosen a theme, the number of dinners, and the number of people the bag shall serve, they proceed to checkout and payment. As mentioned earlier, the available delivery options differ from store to store. In the two stores observed in this master thesis, the store in *Observation 1* offers only in store pickup for the prepacked bags, Mondays between 15.00 - 22.00, while the store in *Observation 2* offers both home delivery on Mondays between 17.00 - 22.00 and pick up in their Drive Thru on Mondays between 12.00 - 22.00.

The Packing Process

The ICA stores that are observed for this master thesis prepare the loose goods orders in their physical stores. An order is prepared one to six hours before loading or customer pickup. Depending on the size of an order it can take up to an hour to prepare. The time for pickup or delivery decides the timeline in which the orders are prepared. Every order has one employee responsible for assembling it. During the busiest times for preparation of online orders, this means that more personnel are required compared to if the customers were to come in to the store and do the shopping themselves. A smartphone and a two-floor trolley are used to facilitate the employees in the packing process. The shopping list from the customer is loaded into the smartphone from the online system. The list with products is arranged to suit the store layout and thereby gives the employee the most efficient picking route. The two-floor trolley is wheeled around the store during the picking to help carry the products during the packing. The trolleys can fit up to eight full grocery bags, and because of their size they sometimes block the way for customers shopping in the store. The preparations of online orders are therefore scheduled to be done during the calm store hours as much as possible. The employee uses the list to check off items as they load them into bags. It is up to the employee to choose the quality of the individual products when an order is assembled. For example, whether the bananas should be more green or yellow. If a product that a customer has ordered is out of stock, the list indicates if the customer allows for the product to be replaced with a similar product. If so, it is up to the employee responsible for the assembling of the order to choose a suitable replacement product. Replacement products will thereby vary depending on the employee picking the order.

How the items are packed differ between the two observed store locations. In the *Observation 1* store, the items are packed in paper bags. Weight and temperature of the products are taken into consideration when packing the bags, and frozen items are placed in individual freezer bags. The cooled items and the freezer bags are placed together in the paper bags as far as possible. For the self-pickup orders,

the cooled and frozen items are separated, and the finished bags are placed in parcel lockers. The lockers have different temperatures, one for chilled foods, one for frozen foods, and one for colonial goods. The bags are placed in a locker with a temperature that suits the content of the bag. This means that the same customer might have to collect their bags from several different lockers.

In the *Observation 2* store, the items are packed in plastic bags that are then placed in SRS-boxes. Bigger items such, as toilet paper, are placed directly in the SRS-box. Frozen items are packed separately in thermo bags with dry ice. When the preparation of an order is finished, the SRS-boxes are placed in a cold room. The SRS-boxes that belongs to the same order are placed in top of each other. The thermo bags with frozen items are placed in a freezing room. This store has two different cooling rooms, one for orders waiting to be delivered home to the customers and one for orders waiting to be picked up in the Drive Thru.

The prepacked bags, on the other hand, are already assembled when they arrive to the store. They are packed centrally by ICA and are then delivered out to the stores. The prepacked bags are also placed in the cold room while waiting to be delivered. The prepacked bags come in paper bags displaying the theme of the content on the side of the bag. All orders, both loose goods and prepacked bags, are marked with the customer name, address and order number. The loose goods orders also come with a waybill stating all items in the delivery.

The Home Delivery

The home delivery setup differs for the two observed stores. The store in *Observation 1* owns their own van equipped with a cooling system. One van is currently enough to cover all the home deliveries made from the store. The paper bags are loaded directly on the floor in the back of the van. One employee from the regular store crew drives the van to make the home deliveries. The route for the home deliveries are determined by the driver. The driver tries to take the shortest route but since the frozen products are not packaged with any extra frigidity, the orders containing frozen products are prioritized to be delivered first. At arrival, the driver rings the doorbell and carries the bags into the hallway. The customer is asked to sign the waybill to confirm that the delivery has been received.

On the day of the observation, two rounds of home delivery are made. In the first round, a couple of orders are delivered to companies and in the second round one order is delivered to a private customer. The private delivery is a ten-minute drive from the store.

In *Observation 2*, a courier company called Budmäster is hired to handle the home deliveries for the store. The courier provides as many vans as necessary to cover the daily deliveries. The vans are equipped with a cooling system to keep the temperature low inside the cargo area. Monday, which is the day when the observation takes place, is usually the busiest day of the week for home deliveries. Around 60 home deliveries are performed on Mondays, compared to 44 which is the average number of home deliveries on the other days of the week. On Mondays, two vans from the courier working full time are usually enough to finish all the deliveries on time, if everything runs smoothly. On days with less deliveries, the courier might combine the deliveries for ICA Mobilia Lund with deliveries of other types of goods for other clients. The drivers from the courier take care of loading the vans at the store. The drivers retrieve the SRS-boxes for the upcoming two-hour timeslot from the cold room and place them in the vans. The SRS-boxes are placed on the floor of the van, sorted after when they will be delivered during the route.

The prepacked bags which come in paper bags are also placed directly on the floor of the van. The drivers divide the orders between each other to simplify the routes. The routes are divided into an inner-city route and a suburban-route. The software used to keep track of the orders has support for route optimization, but this is rarely used. Instead, it is up to the driver to decide the most efficient route. When arriving at a delivery address, the driver unloads the order onto a sack barrow. The driver then wheels the sack barrow to the customer's front door and rings the doorbell. Once inside, the driver unloads the plastic bags from the SRS-boxes and asks the customer to sign the waybill. The SRS-boxes are put back on the sack barrow and the driver brings them back to the van. The prepacked bags neither need to be unpacked nor do they require a signature, they are simply handed over to the customer. The inner-city route has on average one stop per seven minutes while the same number for the suburban route is closer to ten minutes. After completing a route, the driver returns to the store to unload the empty SRS-boxes and pick up the deliveries for the next timeslot. The courier drivers do, in other words, work as the face for the store towards the home delivery customers, since they handle all physical customer contact. An interesting observation is that Budmäster also handle home deliveries of groceries for mat.se and Linas Matkasse, which are competitors in the online grocery market.

On the morning of the observation, some orders that are supposed to be delivered during the first timeslot are waiting for products that have not yet arrived from ICA's suppliers. This forces the drivers to make the first round without those orders and then return back to ICA and bring the delayed orders on the next round.

This causes some deliveries to miss their time slots, and are therefore delivered too late. Some customers express irritation over the late delivery. However, most customers are very understanding.

The authors find that the communication between the drivers from the courier and the personnel at ICA are sometimes deficient. The drivers try to organize the orders in the cold room with the purpose of speeding up the loading process. However, when the drivers return, their organization in the cold room are gone and they have to spend time once again to find the orders for the next timeslot. Once during the day, it occurs that a customer is not home at the time of the delivery, even though the delivery arrives within the agreed timeslot. The driver then leaves the grocery bag outside the door and tries to call the customer to inform that the delivery has arrived. The driver also calls the store to inform them of the event, in case the customer tries to contact them with questions.

In both observations, the loading and unloading of the grocery bags involve some heavy lifting and ergonomically unsound working positions for the driver. The assembling of the bags can also involve heavy lifting in positions that are not ideal.

6 Analysis

This chapter includes an analysis of the findings from the previous chapters. The analysis is based on five key themes, identified within the key takeaways from the theory and interviews. A gap analysis is performed to find existing gaps between how home deliveries are currently performed and the desired approach. Finally, six critical success factors for developing a new delivery solution, are identified.

In the previous chapters, 18 key takeaways were concluded from the interview study, and 14 key takeaways from theory. These have been grouped together in order to find themes among the findings and by performing selective coding. The five most occurred themes have then been selected for further analysis, see Appendix G. The themes that have been concluded from the coding are small volumes, need for a market standard, perishable nature of food products, cost structure, and responsibility. These themes will be further elaborated on in the following sections. A gap analysis is performed by comparing the current situation, identified through the observations and interviews, with the desired approach, based on Chapter 3 and 4 and the findings from the interviews and observations.

6.1 Small Volumes

From examining home deliveries in the Swedish market, both by performing interviews and observations at online grocers and a courier, it appears that the trend of home deliveries results in small deliveries and a lot of half empty trucks. This, mainly due to the fact that customers make small orders, and since the deliveries are spread out over a number of time windows during the day. A large number of possible time windows to choose from will probably increase customer satisfaction, but it will also result in many small deliveries and low fill rates in the trucks. As stated in Chapter 3, the market trend is also developing towards speed deliveries, demanding shorter and shorter product lead times. This is further

challenging the transport efficiency, both from a fill rate and a financial perspective.

The empirical data shows, especially based on the interviews, that volumes are needed in order to perform deliveries cost effectively. As stated in Chapter 4, it is costly to ship half-empty trucks since it costs more or less as much as driving full trucks. The traditional way to perform deliveries have therefore been to deliver as seldom as possible but in large quantities, so called bulk deliveries. Historically, this has been feasible to do since the groceries have been delivered to stores where the customers go to buy it. From a logistics perspective, this is the most efficient way to perform deliveries, since it enables transport of large quantities and maximizes the vehicle fill rates. The requirements in Chapter 4 bring up two challenges that is connected to transport of small volumes. These are the challenges of transporting small cargo due to poor stackability capacity, and to fulfill the temperature requirements, which is harder the smaller the packaging is. But as the customers increasingly demand speed deliveries to their homes, as concluded in Chapter 3, a solution to perform these deliveries cost effectively must be developed. This has not been done yet.

The requirements presented in Chapter 4 shows that the secondary packaging is critical for the transports in order to achieve a certain level of stackability and fill rates in the trucks. However, this only applies when the volumes are large enough. As concluded during the observations at ICA and Budmäter; if the ordered volumes are not large enough to fill a truck, the grocery bags will be placed straight inside the door on the truck floor anyway, since it is the easiest way for both loading and unloading the bags. It is however critical to understand the importance of the stackability during transport if the volumes are large enough to fill a truck. Otherwise, as stated in Chapter 4, the vehicle fill rate and the transport cost efficiency will not be maximized.

The analysis of the empirical data and the theory from Chapter 3 and 4 presented in this section, shows that there is an existing gap between how home deliveries are currently performed, based on the observations at ICA and the interviews, and the desired approach enabling optimal route planning and vehicle fill rates. This indicates a need for a solution to perform home deliveries of small volumes cost effectively. Examples of solutions that could solve this is presented in Table 6.1. It is assessed that by developing an unattended delivery solution and hence eliminating the need of time windows, the number of routes could be minimized and the vehicle fill rates maximized. An implementation of collective or individual unattended delivery boxes is therefore suggested.

Table 6.1. *The first gap between how things are currently performed, based on the observations at ICA and the interviews, and the desired approach, with a possible solution.*

<i>Gap</i>	<i>Possible solution</i>
Lack of solution to perform speed deliveries of small volumes cost effectively.	<ul style="list-style-type: none"> • Eliminate the need of time windows by developing an unattended delivery solution. • Maximize the fill rate by minimizing the number of routes, and deliver to either collective or individual delivery boxes.

6.2 Need for Market Standard

From the secondary research of customer preferences in the e-grocery market, presented in Chapter 3, it is found that the customers value convenience. Convenience, in terms of delivery locations coinciding with the customers' daily habits, such as the office or parcel lockers at the train station, is an important factor affecting customer satisfaction. In several customer surveys investigated in Chapter 3, many of the respondents state that they choose to shop groceries online since they find it more convenient, especially with home deliveries. Furthermore, many customers value speed deliveries, meaning a short time from placing the order to receiving the delivery, for example same-day or instant deliveries. SST, such as parcel lockers, has shown the ability to increase customer satisfaction if the technology is easy to use. This, since delivery solutions enabling SST give the customers the opportunity to collect their delivery at any time that suits them best.

The interviewed logistics providers and online grocers agree that the current way to perform home delivery of groceries is not optimal. With the home delivery model used today, it is neither possible to optimize the customer satisfaction, nor the cost effectiveness for the company performing the deliveries. Furthermore, several of the other existing delivery solutions presented in Chapter 3, such as regular parcel lockers and unattended home delivery, are not suitable for groceries since these types of products need to be kept refrigerated.

The interviews revealed that it is hard to make profit in the e-grocery market. MatHem, the biggest online grocer in the Swedish market, has not reached a positive result in eleven years (Online grocers 2017). According to the interviews, costs associated with home deliveries is one of the primary reasons for this. The most commonly used home delivery model today, where the customer can choose a time window when they prefer their delivery, is costly for the logistics providers. This, since it results in ineffective delivery routes and unutilized cargo areas in the

delivery vans. Among the interviewees, it seems to be a common perception that the customers are not willing to pay for the actual costs that come with home deliveries. As mentioned in Chapter 3, the competition in the Swedish e-grocery market is fierce and one of the main competitive tools is price.

Overall, the growing online market has put higher demands on logistics providers and their drivers. Home deliveries imply that the driver handles interaction with customers and thereby must be able to provide customer service. This requires a set of skills that are not needed for the traditional bulk deliveries. It hence put more responsibility on the drivers as their actions towards the customers affect the brand. As stated during the interviews, the part of the SC that logistics providers are responsible for continuously expands. This develops both ways and does not only include the customer interaction part, but also backwards with terminal activities. As the customer surveys presented in Chapter 3 shows, the customers predict that their demands for future delivery solutions will be even higher. The increasing demands from customers, the high costs, and the extended responsibility drive logistics providers to find new, more time efficient and cost effective delivery solutions.

Today, many of the logistics providers have parcel lockers and pick up services installed at different locations. From these, customers can pick up deliveries of other types of products. However, these solutions are bound to a certain logistics provider, and only deliveries from that provider can be made there. All interviewed logistics providers agree that this is not a viable solution for the future. As discussed in Chapter 3, there are also several ongoing pilot projects for home deliveries in the Swedish e-grocery market. The variety of unattended delivery solutions and pilot projects, confirm that existing delivery solutions are not sufficient and that there exists a demand for a better solution. The performed interviews with Nowaste employees, logistics providers and online grocers, suggest that in order to make a new delivery solution that solves the current issues in the last-mile, the solution cannot depend on time windows. Furthermore, the interviewees share the view that a new delivery solution for food products should perform independently, and hence not be bound to a certain logistics provider.

An analysis of the customer preferences, presented in Chapter 3, shows that the customers value the convenience of home delivery, but prefer if deliveries could be made even when they are not home. As discussed in the previous section, customer surveys also indicate an increasing demand for speed deliveries. Observations and interviews with online grocers and logistics providers suggest that the current home delivery model is costly, and that they struggle to keep up

with the increasing demands from the customers. They are therefore in a need of a solution to perform home deliveries when the customer is not home, in order to lower the costs of home deliveries. Hence, there is a gap between the desired situation, based on the demands from customers and logistics providers, and the currently used delivery model.

Examples of solutions that could eliminate this gap are presented in Table 6.2. It is assessed that by developing an unattended delivery solution, and hence eliminate the need of time windows, will lower the delivery cost for the logistics providers. An unattended delivery solution also eliminates the need of the customer being home, which is in line with the customer preferences. An implementation of collective or individual unattended delivery boxes is therefore suggested.

An unattended delivery solution for groceries must be able to keep the cold chain intact until the customer pick up the products. A solution therefore requires some sort of cooling system, which in itself is costly. Interviews performed at other organizations predict trends where even more players will enter the e-grocery market. Small niched players covering only smaller geographical areas are forecasted to increase in the future. This also supports the claim for a standard delivery solution that all providers can use, instead of everyone developing their own solution. All of the interviewees agree that in order to establish a new market standard for deliveries, it requires that all logistics providers use it.

Table 6.2. The second gap between how things are currently performed, based on the observations at ICA and the interviews, and the desired approach, with a possible solution.

<i>Gap</i>	<i>Possible solution</i>
Lack of solutions to perform home deliveries of groceries if the customer is not home.	<ul style="list-style-type: none"> • Increase the customer satisfaction and fulfill their rising demands by developing an unattended delivery solution. • Lower the cost to make home deliveries by enabling home deliveries without time windows through an unattended delivery solution. • Establish a market standard delivery solution that all logistic providers and product owners can use to make their home deliveries.

6.3 Perishable Nature of Food Products

From the interviews and the research on food requirements, presented in Chapter 4, it is found that managing the cold chain is the single most challenging part of

delivering groceries. As the research suggests, there are several regulations to take into consideration when handling and transporting groceries. However, from the interviewed logistics providers' and online grocers' point of view, the customer expectations on quality are often higher than what the legislation demands. It is concluded from the interviews that the providers in the industry are well aware of the regulations, but that they become a secondary priority. They are instead more concerned about the the products keeping a high quality all the way through the SC until the delivery to customers.

The quality concern is not unique for home deliveries, it is just as important when performing bulk deliveries to wholesalers and stores, which many of the logistics providers have substantial experience from. The reason that the quality concern is more complicated for home deliveries, is due to the small volumes and different types of products packed together. For home deliveries, products are often packed in the same type of bags that the customers use to carry their groceries home from the store. Challenges with transporting different types of products together are explained in Chapter 4. Bulk transports are often loaded with the same or a couple of different products. The same type of products is packed together and different products are placed separately from each other. In a large truck it is also easier to keep different temperature zones if necessary.

When storing and transporting mixed grocery bags, it is essential that the temperature is not too high for some products, such as meat and milk, since this allows harmful bacteria to grow in the products. Therefore, it is best to keep all products in a low temperature considering this will safely preserve the quality of most products. However, a few products such as bananas are sensitive to low temperatures and their quality can be affected if kept in a low temperature for too long. If frozen products are involved, the complexity rises yet another level. There is no solution today that allows the logistics providers to leave the groceries outside the customer's house, and still keep the cold chain intact until the customer arrives home. There are however refrigerated parcel lockers used by some stores to offer the customers unattended in-store pick-up. For home delivery, if the customer is not there by the time of delivery, many providers leave the groceries outside the door. As presented in Chapter 4, the food will last between 10-20 minutes before the quality of some products starts to be affected, during non-extreme weather conditions.

As discussed in Section 6.2, both customers and logistics providers express a demand for a delivery solution that enables deliveries even when the customer is not home. However, in order to make this possible, the cold chain for the delivery

must be kept until the customer arrives home. This implies a gap, since there is no existing commercial delivery solution that enables unattended home delivery while keeping the cold chain intact. There is a pilot project called in-fridge delivery, which is a possible solution for this gap. However, this solution is limited since it can only be offered to customers with an electronic lock on their front doors. Therefore, a refrigerated, collective or individual, unattended delivery box is suggested, see Table 6.3.

Table 6.3. *The third gap between how things are currently performed, based on the observations at ICA and the interviews, and the desired approach, with a possible solution.*

<i>Gap</i>	<i>Possible solution</i>
Lack of solutions to keep the cold chain for home deliveries if the customer is not home.	<ul style="list-style-type: none"> • Develop a refrigerated unattended delivery solution that keeps the cold chain unbroken until the customer arrives home. • Deliver the groceries all the way into the customer's fridge.

6.4 Cost Structure

The interview findings show that it is currently hard for companies to make profit of their e-grocery sales. As discussed in Section 6.1 above, this is mainly due to small ordered volumes and few deliveries per route, as a result of a large number of time windows to choose from. At the same time, customers have not fully embraced the market for e-groceries. As the findings from the theory in Chapter 3 shows, the majority of customers will choose the cheapest form of delivery and at this point, home deliveries are not. Additionally, as discussed in Chapter 3 and as the interviews at online grocers shows, there is an increasing number of market players and competition from traditional grocery stores, which pushes down the prices and pressures the online grocers to compete with price. This further challenges the need to charge enough to cover the additional costs that comes with delivering the groceries to the customers' homes. The theory presented in Chapter 3 confirms that in a market for low value products, the transportation costs when delivering to the final customers is critical in order to maintain competitive. This creates a large gap between what the customers are willing to pay and what the goods owners would have to charge in order to make profit of home deliveries.

In a growing industry, with a continuous rise in the number of market players, the profit margins are small. This is presented in the theory in Chapter 3, and hence confirms the findings obtained through interviews and observations. In Chapter 3,

it is furthermore stated that the current situation in the market has resulted in a possibility for online grocers to gain competitive advantage from developing cost effective purchasing and logistics strategies. One of the findings from the interviews shows that a critical aspect to consider when performing home deliveries is to minimize the time spent per delivery. This is also realized during the observations, as the deliveries with the furthest distance from the store, which hence result in the longest time spent per delivery, also are the ones that cost the most to perform. Finally, as discussed in Section 6.1 above, larger volumes per delivery would result in greater cost effectiveness.

The previously presented analysis of the empirical data, gathered during interviews and observations, and the theory presented in Chapter 3, shows that there is a gap between how much the customers are willing to pay and the logistics providers' costs to perform home deliveries. It is estimated, that by developing an unattended delivery solution and hence increase the volumes and minimize the time spent per delivery, the cost effectiveness of performing home deliveries would increase. This, enabled by the elimination of time windows, since this would optimize the route planning and the vehicle fill rates. The fourth gap and the possible solution to it is presented in Table 6.4.

Table 6.4. *The fourth gap between how things are currently performed, based on the observations at ICA and the interviews, and the desired approach, with a possible solution.*

<i>Gap</i>	<i>Possible solution</i>
Difference between how much the customers are willing to pay and the logistics costs of home deliveries.	<ul style="list-style-type: none"> • In order to increase cost effectiveness in the last mile, volume is needed and the time spent per delivery must be minimized. • By developing an unattended delivery solution, and eliminating the need of time windows and maximizing the vehicle fill rates, the transportation costs can be minimized and competitive advantages gained.

6.5 Responsibility

As earlier indicated, the development of an unattended delivery solution would be of great use in order to reduce some of the existing challenges in the last mile. However, this implies other challenges in terms of responsibility for the delivery. According to the findings from the interviews, there is currently no market standard stating what party that would have to take the risk when leaving the groceries unattended. Another interesting result from the interviews, and more

specifically the gathered quantitative data, is that there is a significant difference in how the importance of security is ranked among the interviewees. Most interviewees rank this as of lowest significance, while some of them value it much higher. In Chapter 4, requirements to meet different scenarios that can be seen after leaving a delivery unattended are presented. Potential incidents that may occur could be that the groceries end up stolen or contaminated, by for example animals. According to the interviewees, this must be solved by developing a market standard, that communicates when the responsibility is transferred from the goods owners or the logistics providers to the customers. From the logistics providers' perspectives this often implies that a written signature is needed from the receiver. This, in order to hold a written confirmation that affirms that the responsibility of the goods have been transferred to the customer.

Theft is, as stated above, one risk and a potential outcome when leaving groceries unattended outside for example customers' homes. In Chapter 4, it is also concluded that the delivery solution must be able to keep the delivery safe from theft. The development of a delivery solution must therefore include a locking device that means that the customers can feel safe, knowing that the groceries are delivered to a "burglarproof" delivery solution. One possible solution could be that the logistics providers' demand for a written signature and the access to lock up the device are incorporated in a technical application, using SST. According to the theory presented in Chapter 3, one potential gain of using SST is increased customer satisfaction. This would require a permission from the customer to lock up the device and at the same time provide the logistics provider with a written signature. This, by having the customers using their smartphones and for example a mobile bank identification. For the development of a market standard, this would also realize the stage when the responsibility is transferred from the logistics provider to the customer. If it were feasible to incorporate these features into a delivery solution, the risk of contamination would also be minimized. However, using the right materials for the delivery solution would be critical in order to eliminate all potential risks of contamination.

In terms of the risk for theft and contamination, there is a lack of standard of when the responsibility is transferred from the logistics provider to the final customer. With the currently used home delivery model, logistics providers are in need of the personal interaction between them and the customers, since their responsibility of the goods are handed over to the customers when they receive the written signature. When groceries are to be left unattended there is no standard for when the responsibility is transferred. This indicates that there is a gap between the current and the desired approach, and possible solutions to solve this is presented

in Table 6.5. It is assessed that the gap potentially could be solved by enabling electronic signature through usage of for example mobile bank identification. The transfer of responsibility would then be realized when the logistics provider has electronically confirmed the delivery in the mobile application.

Table 6.5. *The fifth gap between how things are currently performed, based on the observations at ICA and the interviews, and the desired approach, with a possible solution.*

<i>Gap</i>	<i>Possible solution</i>
Lack of standard when to transfer the responsibility of an unattended delivery.	<ul style="list-style-type: none"> Enable access to the delivery solution by using SST and mobile bank identification.

6.6 Critical Success Factors

Several gaps between how home deliveries of groceries are performed today, recognized during the observations and interviews, and the preferred characteristics and requirements for a new solution, have been identified. These gaps are then used to develop six critical success factors that the authors find essential to take into consideration when developing a new home delivery solution. The critical success factors emphasize requirements that a new delivery solution should fulfill, and are presented in Table 6.6 below. The critical success factors are developed in order to facilitate for the buildup of a general delivery solution, possible for all logistics providers to use.

Table 6.6. *The six critical success factors when developing a new home delivery solution, found by the authors.*

<i>Theme</i>	<i>Critical Success Factors</i>
<i>Small volumes</i>	1. Be able to perform deliveries of larger volumes, meaning, more delivered orders per route.
<i>Need for market standard</i>	2. Enable unattended home delivery. 3. Be independent, available for all logistics providers to use.
<i>Perishable nature of food products</i>	4. Keep the cold chain unbroken until the customer comes home.
<i>Cost structure</i>	5. Meet the demands of both customers and logistics providers in terms of price and cost.
<i>Responsibility</i>	6. Keep the delivery safe from both theft and contamination.

The critical success factors combine some attributes that are required (success factors 4 and 6), with some that are desired in order to develop a better delivery

solution than the ones that exist today (success factors 1, 2, 3 and 5). The success factors are assessed to be achievable within a short period of time, since pilot projects are currently contemplating several of them. For example, in-fridge and in-car deliveries are both considering the critical success factors 1, 2 and 5. The critical success factor number 3, that the solution must perform independently and be available for all logistics providers to use, is currently the most challenging to obtain. This, since it is considered to be the furthest from being achieved.

6.6.1 Evaluation of Existing and Future Solutions

A new concept for making home deliveries are suggested since the existing and future delivery solutions are all deemed to lack one or more of the desired features, as stated in the previous section. A review of the delivery solutions examined in this master thesis, and whether they fulfill the established success factors, are displayed in Table 6.7 and Table 6.8.

Table 6.7. A review of current delivery solutions, examined in this thesis, and an assessment of whether they fulfill the success factors.

<i>Delivery solution</i>	<i>Unfulfilled success factor</i>
<i>Collection point</i>	<ul style="list-style-type: none"> 2. Requires the customer to pick up the delivery at an external location. 3. Most collection points do not accept deliveries from all logistics providers.
<i>Click & Collect</i>	<ul style="list-style-type: none"> 2. Requires the customer to pick up the delivery at an external location. 3. Click & Collect delivery are often bound to a goods owner.
<i>Parcel Locker (refrigerated)</i>	<ul style="list-style-type: none"> 2. Requires the customer to pick up the delivery at an external location. 3. Parcel Lockers are often bound to a logistics provider.
<i>Attended home delivery</i>	<ul style="list-style-type: none"> 1. The delivery route must be adapted to time windows which prevents deliveries of larger volumes. 2. Requires the customer to be home. 5. Costly for customers and logistics providers.
<i>Unattended home delivery</i>	<ul style="list-style-type: none"> 4. Current unattended deliveries do not preserve the cold chain. 6. The delivery is simply left outside the door.
<i>Bike couriers</i>	<ul style="list-style-type: none"> 1. Only a small amount of deliveries at a time. 2. Requires the customer to be home. 4. Current deliveries do not preserve the cold chain.

Table 6.8. A review of future delivery solutions, examined in this thesis, and an assessment of whether they fulfill the success factors.

<i>Delivery solution</i>	<i>Unfulfilled success factor</i>
<i>Autonomous Ground Vehicles with Parcel Lockers</i>	<ol style="list-style-type: none"> 2. Requires the customer to be home. 3. Hard to make independent implementation. 5. Requires large investments for logistics providers.
<i>Drones</i>	<ol style="list-style-type: none"> 1. Can only make one delivery at a time. 2. Requires the customer to be home. 3. Hard to make independent implementation. 4. Do not preserve the cold chain. 5. Requires large investments for logistics providers.
<i>Droids</i>	<ol style="list-style-type: none"> 1. Can only make one delivery at a time. 2. Requires the customer to be home. 3. Hard to make independent implementation. 5. Requires large investments for logistics providers.
<i>Crowdsourcing</i>	<ol style="list-style-type: none"> 1. Only a small amount of deliveries at a time. 2. Requires the customer to be home. 4. Do not preserve the cold chain.
<i>Semi-Autonomous Ground Vehicles</i>	<ol style="list-style-type: none"> 1. The delivery route must be adapted to time windows which prevents deliveries of larger volumes. 2. Requires the customer to be home. 3. Hard to make independent implementation. 5. Requires large investments for logistics providers.

7 Solution

In this chapter, the home delivery solution developed by the authors is presented. The solution will be presented as a concept, meaning the whole system including different attributes for villas and apartments, different measurements, temperature adjustments, cost structure, the delivery network, and technology and applications. The system has been developed based on the findings and the critical success factors obtained during the master thesis research. The aim of this chapter is to describe the recommended solution, and how it would serve goods owners, logistics providers and customers in the delivery network.

The findings in the previous chapters have provided the authors with insights in the last-mile logistics, and the existing challenges and issues that exist when performing home deliveries of groceries. The findings resulted in 14 key takeaways from the literature, presented in Chapter 4, and 18 key takeaways from the interviews, found in Chapter 5. Further analysis of the key takeaways resulted in five themes, and finally in six critical success factors. The analysis is presented in Chapter 6. The critical success factors have been serving as a foundation when developing the home delivery solution. Furthermore, the development of a new delivery concept has grown continually from the point that the authors started the data collection process, until the analysis of the findings was finished. In Chapter 3, current and future delivery solutions are examined. During the analysis, in Chapter 6, those delivery solutions are evaluated from the perspective of whether or not they fulfill the critical success factors. Since none of them are deemed to fulfill all of the factors, a new concept has been developed. A gap analysis is performed, and potential ways to eliminate the gaps are established. These ideas are then used to develop different systems, by carrying out brainstorming on how the ideas could serve different delivery concepts. The concept has developed and changed along with the work of this thesis, in order to make the concept fulfill all of the critical success factors. The final delivery concept is presented in this chapter.

7.1 System Description

The home delivery concept is based on a delivery box, that will be placed outside the residence of the customers. The solution can be thought of as a larger post box with an adjustable cooling function, in order to meet the demands of both groceries and other products. The delivery boxes will realize the benefits of using an unattended delivery solution, since it enables for logistics providers to deliver the groceries at any time during the day, and for customers to pick it up whenever it suits them the best. It is established in Chapter 6 that both customers, logistics providers, and goods owners have a desire for delivery solutions that enables home deliveries of groceries even when the customer is not home. To make this possible, the solution must be able to keep the cold chain intact until the customer arrives home. Depending on whether the customers are living in villas or apartments, the concept will differ. More about the different implementations in Section 7.2. The delivery boxes will also be manufactured in different sizes, in order to suit the different demands of different customers. Customer research, presented in Chapter 3, indicates different needs for different target groups. For example, families living with children purchases larger volumes than single households, and would probably need larger delivery boxes. The customers living in villas will have the opportunity to choose what size they want for the delivery box, based on their needs and buying behaviors. In apartment houses, however, the delivery boxes will be implemented in common areas in a variety of sizes in order to suit the different properties of various products. The different measurements of the delivery boxes will be presented in Section 7.2.1.

The delivery boxes will be equipped with cooling and freezing functions, in order to enable storage of groceries during the day. To simplify the preserving of different temperature requirements, moveable walls will be used inside the delivery box. These walls will have an isolating effect, minimizing a temperature exchange between the different zones. The adjustments to various products with different temperature requirements will be further elaborated on in Section 7.3. As stated in Chapter 4, and as one of the critical success factors confirms, the cold chain must be kept intact in order to preserve the quality of the groceries.

As previously mentioned, the customers living in villas will have the opportunity to order the size of delivery box that suits their buying behaviors best. The incentive to buy a delivery box must be based on the convenience that it contributes with, and this must motivate the customers enough to pay for the

delivery boxes themselves. More about the recommended cost structure in Section 7.4.

One of the critical success factors, presented in Chapter 6, is that the solution must be able to perform deliveries of larger volumes. In order to find volume within the system, a network of users and suppliers are needed. One key aspect of the delivery concept, based on the analysis in Chapter 6, is therefore the need of a delivery network of both customers and logistics providers, that must perform independently. The structure of the delivery network will be further introduced in Section 7.5. When the delivery network and the system have reached maturity and process efficiency, it is recommended to introduce a return flow as well.

Since the customers will not be home to receive the goods, the delivery box must be equipped with a locking device. This is established based on the insights from the interviews and Chapter 3 findings, which led up to the development of critical success factor number 6; Keep the delivery safe from both theft and contamination. To be able to perform this and still achieve the expectations of an unattended delivery, technology and applications will be integrated in the solution. What technology and how it will interact with other devices, will be established in Section 7.6.

7.2 Different Implementations

As stated in the previous section, the concept of the delivery box will differ for customers living in villas and apartment buildings. For the customers living in villas, it will only depend on their self motivation whether they will possess a delivery box or not. It will be possible for these customers to make a purchase at a website owned by an independent company called Delivery Box, accessible from www.deliverybox.se. From this website, customers can choose between three different box sizes, and register as a delivery box user. The profile will then be connected to an address and a delivery box. When shopping for groceries online, the customers can choose to have their groceries delivered to the delivery box by entering their delivery box identification number. The suggested day of delivery will primarily be the day after the order has been placed, but if the customers prefer a later delivery that is also optional. The customers are guaranteed delivery before 17:00 on the chosen day of delivery. If the system network is established, it is expected to simplify the performance of same day deliveries. After the order has

been placed, the system will be able to inform the logistics provider of the chosen mode of delivery, and what address the user is registered at.

The customers living in apartments will have less power to choose whether or not they will have the possibility to order their groceries to a delivery box. As indicated in Section 7.1, the boxes in apartment buildings will be installed in common areas. The initiative to install delivery boxes in apartment buildings should ideally come at a design stage, and be implemented in all new buildings. Additionally, in existing properties, housing cooperatives are recommended to take the initiative to implement delivery boxes. As previously mentioned, it is critical to obtain a network of users. This is established in the critical success factors, as it is concluded that the solution must be available for all logistics providers to use. To be able to motivate the housing cooperatives to make the investment, they will be offered with package deals and quantity discounts. The marketing towards housing cooperatives will also focus on the attractiveness that the delivery boxes will contribute with, due to the service it provides to the residents living in the building. In the end, it is however recommended that the residents will be the ones paying for the solution, through an increased rent that covers the delivery boxes investment costs. More about the cost structure in Section 7.4. As in the case of customers living in villas, the residents living in apartments should register as delivery box users to be able to choose delivery box as the mode of delivery.

7.2.1 Measurements

Whomever living in a villa have the opportunity to order their own delivery box at the website. As mentioned in the previous sections, these customers will have the opportunity to choose between three different sizes when they are placing an order of a delivery box. Initially, it is recommended that the delivery boxes are manufactured in the sizes small, medium and large. The measurements for the three different sizes differ in delivery box width, see Table 7.1. For apartment buildings, the measurements of the installations will be elaborated on further down this section. The customers living in villas will also have the opportunity to choose where on their plot they want to place the delivery box, as long as it can be easily accessed by the logistics providers. Since this master thesis focus on e-groceries and mixed grocery bags, the development of delivery boxes and the measurements have been based on the number of grocery bags one box can hold. One grocery bag measures approximately 20 cm (depth) * 40 cm (width) * 40 cm (height), and

the size of a delivery box will be based on the number of grocery bags that could be placed in a row. Adding 10 cm to the width of the grocery bag, covering the outer wall and some margins, resulting in a delivery box depth of 50 cm. In order to set the width of the delivery boxes, 5 cm are added to the grocery bag depth in order to enable some space between the bags and to give room for the moveable walls; resulting in a 25 cm depth per grocery bag. Adding another 10 cm to the total width, results in the delivery box widths 60 cm ($2*25+10$) for a small box, 110 cm ($4*25+10$) for a medium box, and 160 cm ($6*25+10$) for a large box. Furthermore, 10 cm are added to the grocery bag height, in order to give some headroom for the groceries that pop out of the bag. All the measurements for the three different sizes, including the number of liters one box could hold, are presented in Table 7.1.

Table 7.1. The three different sizes of delivery boxes and their measurements, listed in depth (*d*), width (*w*) and height (*h*), and the number of liters for every delivery box size.

<i>Size</i>	<i>Number of grocery bags</i>	<i>Approximate measurements (d*w*h)</i>	<i>Liters</i>
<i>Small</i>	Two	50*60*50 cm	150 l
<i>Medium</i>	Four	50*110*50 cm	275 l
<i>Large</i>	Six	50*160*50 cm	400 l

The demand for a variety of different sizes is not as large in apartment buildings, since these installations will consist of several delivery boxes assembled together, creating a pickup station with a number of lockers. It is also possible to continuously adjust the number of delivery boxes per installation. In new buildings, the number of boxes should accommodate the same target group as the residential area. For example, if the designed residential area is located in Stockholm and is aiming towards families with children, the number of delivery boxes should cover for approximately half the number of households. This is based on the fact that close to 50 percent of the families living with children in Stockholm have signed up for grocery bag subscriptions (Björk 2016). In that case, an apartment building with 15 apartments, should have eight delivery boxes installed in a common area. For example, this could be on the bottom floor of the stairwell, in a common storage area, or in a courtyard. An installation of eight delivery boxes means two sections of four boxes, or six grocery bags, each.

The sections are built in three levels, where the two lowest levels consist of one locker, which contains two grocery bags, each. The highest level consists of two lockers that can only fit one grocery bag. The size of the delivery box station will

hence depend on the number of installed sections. For examples of station measurements and the number of liters one station could hold, see Table 7.2. Two sections, or eight delivery boxes, might initially be slightly over dimensioned, even in an apartment building of 15 apartments. But as the online sales industry continue to grow, the implementation must be able to meet the increasing number of home deliveries. Since it is also possible to deliver other products than grocery bags, the fill rate of the delivery boxes will be further increased. It is furthermore possible to upgrade already installed delivery box stations with additional sections, in order to meet an increased demand in the future.

Table 7.2. Example of three different station measurements, depending on the number of installed sections. Measurements listed in depth (*d*), width (*w*) and height (*h*), and the number of liters per installed section.

Number of sections	Number of boxes	Number of grocery bags	Approximate measurements (<i>d*w*h</i>)	Liters
1	4	6	50*60*150 cm	450 l
2	8	12	50*120*150 cm	900 l
3	12	18	50*180*150 cm	1350 l

7.3 Temperature Adjustments

In order to enable home delivery when the customers are not home, the solution must be able to keep the goods refrigerated until the customers come home. This has been concluded from both the requirements in Chapter 4 and the performed interviews and observations. The proposed solution will therefore be equipped with a cooling system. The cooling system gives the box the same functionality as a fridge, but where the cooling function can be turned off when the box is empty. This implies that the box must be plugged in to a power outlet in order to power the cooling system. The results from this master thesis research, has shown that the solution should be able to hold the delivery and retain the quality of the goods for at least 14 hours. This time span has been found appropriate, since it allows logistics providers to make their deliveries during “normal” work hours, between 8-17. It also means that even if a delivery is made early in the morning, the customer would not need to be home to empty the delivery box until 22:00. Thereby, it enables the logistics providers to schedule the deliveries according to the most efficient routes, without the need to adapt the routes to the customers’ preferred time windows. At the same time, it provides the customers with more

freedom, since they are not tied up to be home in time for the delivery. These are both desired characteristics for a delivery solution, found in the research of customer preferences in Chapter 3 and the interviews with logistics providers, presented in Chapter 5.

The cooling functionality should preferably be activated some time before a delivery, so that the box has the correct temperature when the delivery arrives, and turned off when the delivery box is emptied. It is important that the box keeps the right temperature when the delivery arrives, in order to ensure the quality of the goods. Keeping the correct surrounding temperature is critical to maintain the quality of the products. This has been found from the research on food product requirements presented in Chapter 4. However, keeping the cooling system on at all times, like a fridge, is both unnecessary and energy wasting. Therefore, technology that allows the cooling system to turn on at a certain time before the delivery, would be optimal. The software used to optimize the routes could be used to find the optimal time to turn on each box within a route, and to send out notifications to the boxes in a route when the cooling system should be turned on. More about the technology and applications in Section 7.6. The box should also have a thermostat that indicates the temperature inside the box, in order to make it easy for both logistics providers and the customers to verify the temperature. The solution will at first hand be adapted for groceries, but preferably work for other types of products as well. This also supports a cooling system that can be turned on and off. When deliveries of other products are made, for example shoes or clothes, there is no reason for the cooling system to be turned on.

From the observations and the research on food product requirements in Chapter 4, the authors have concluded that the content of a “standard” grocery bag can be divided into four categories; cooled items, frozen items, temperature sensitive items, and non-temperature sensitive items. Cooled items are for example dairy products and meat. Frozen items can be anything from ready cooked meals to frozen fish. Temperature sensitive items are bananas and fresh basil, and non-temperature sensitive items are products like toilet paper and flour. Based on the food product requirements presented in Chapter 4 and collective knowledge from the interviews with logistics providers, the authors have come to the conclusion that the best option is to keep all the groceries, except for the frozen products, in a refrigerated common temperature until the customer arrives home. Even though some products are sensitive to lower temperatures, it is deemed that the time window between the delivery and customer arrival will be short enough to have minimal impact on the quality of the goods. Compared to the cost and complexity it would add to implement a warmer temperature zone, the benefits are deemed to

be too small. One suggestion could also be to package certain temperature sensitive products, like bananas, in bags that provide protection against the cold.

As explained in Section 7.2, the implementation of the box will differ depending on what type of property it belongs to. Therefore, the solutions for frozen products have slightly different designs. Temperature adjustments for the apartment concept are explained further down this section. For the villa concept, two possible solutions are proposed. As mentioned earlier in Section 7.1, the solution will include movable walls that can be used to divide the box into different compartments. One solution is therefore to enable a lower temperature in one compartment of the box. This solution depends on whether the cooling system can provide different temperatures for different parts of the box, or not. This solution requires a more complex cooling system. The other solution uses the walls to create separate compartments but keeps the same temperature in all compartments. In this case, the frozen products will be placed in one separate compartment together with dry ice, that helps to keep a lower temperature in that part of the box. For both of the suggested solutions, it is critical that the walls isolate between the different compartments of the box, in order to ensure that the different temperatures for each compartment are kept.

The solutions for the apartment concept are similar to the villa concept in many ways. The main difference is that this concept enables usage of several lockers for one delivery. If the cooling system could be set at different temperatures, this means that a delivery containing both cooled and frozen food products can be placed in two different lockers; one locker that keeps a refrigerated temperature and another that keeps a freezer temperature. The other possibility is that all the lockers keep the same refrigerated temperature, but the deliveries are still separated and placed into two lockers. Dry ice is added to the locker with the frozen products in order to keep these products frozen.

7.4 Cost Structure

Even though the customers living in villas will be given the advantage and the opportunity to choose the most suitable size for their needs, the investment will probably be perceived as much bigger for these customers, in comparison to the ones living in apartment buildings. This, since the initial investment in apartment buildings will be made by the housing cooperatives. The price of a delivery box is recommended to be set between 2 000 and 5 000 SEK. The price includes a profit

margin and varies for the different sizes of boxes. The price is approximate, and based on estimations performed by the authors. The estimations are based on that there are many offered common fridges in the price range between 2 000 and 5 000 SEK, with approximate volumes between 50 and 400 liters. Since the proposed solution offers an entirely new concept, it might be hard to motivate the customers to pay more than that in the beginning. This, since the research on customer preferences in Chapter 3 shows that many customers are price sensitive.

The reason why more profound calculations of the price have not been performed is since the purpose was to primarily develop a conceptual solution. The research has therefore not focused on the physical implementation of a delivery solution, but rather the drawbacks in the last mile and inefficiencies when performing home deliveries. Calculations on what it would cost to actually develop and manufacture the product have not been performed within this research, and the price of the boxes can therefore only be estimated. In order to make a more accurate recommendation of the price, it is therefore suggested that a market research should be performed. This, in order to thoroughly examine whether or not the customers are willing to pay the price of the proposed solution. Only when further investigations have been performed, together with the calculations on what it would cost to manufacture the product, a fixed price can be set and recommended to the company.

As indicated above, the fact that the customers living in villas must make the investment of buying their own delivery box, could be perceived as a large drawback to some customers. As concluded in Chapter 3, customers are price sensitive and the marketing towards the customers should therefore focus on the benefits, including the financial gains, that are accessible to gain on a long term. As the online sales industries continue to grow, and the customers are given more and more opportunities to order their products online and have it home delivered, a durable delivery solution that enables for smooth and non-interactive deliveries between customers and logistics providers must exist. If a customer expects several home deliveries during one week, it is possible to save a lot of time and energy if it is not necessary to be home to receive the goods. The main idea of the cost structure is furthermore that all deliveries to delivery boxes will be free of charge. For customers who order products online on a regular basis, the investment cost would therefore be paid off in a short period of time. For example, in the observed stores the prices of home deliveries are set between 89 and 99 SEK. If a delivery box costs 2 000 SEK and the customer orders home delivery of groceries once a week, the delivery box would be paid off in 20 weeks.

In apartment buildings, the customers would not notice the investment cost in the same sense, since it would be made by the housing cooperative, or built in from the beginning in new houses. As stated in Section 7.2, it is however recommended that it should be the residents paying for the solution, since it is a service available for everyone listed in the building. But this is entirely up to the housing cooperative and their financial situation. Some housing cooperatives would probably want to make the investment as a service to their residents and as an incentive to increase the attractiveness for apartments in their properties. As in the case of customers living in villas, deliveries would be free of charge once the delivery boxes have been installed.

The cost of operating the system will be to power the boxes with electricity, in order facilitate the boxes with the refrigerated function. For customers living in villas, this will add to the total cost, aside from the price that is set to invest in the box. In apartment buildings, it is recommended that the housing cooperatives will be responsible for operating the system, and hence pay the electricity costs. It is estimated that the delivery boxes will not consume more electricity than common fridges. The electricity cost for keeping a new fridge at a refrigerated temperature is approximately 1.18 SEK per day (Fortum 2016). It is assumed that the cost of cooling down the delivery box to a refrigerated temperature demands more energy, and hence implicate a higher cost, than to keep a common fridge at its correct temperature. However, it is estimated that the cost of electricity will not exceed 5 SEK per delivery.

7.5 Delivery Network

In order for the proposed solution to rise to its full potential and solve the efficiency problems for the logistics providers, it requires that the solution is used by a sufficiently large number of households. Unless everyone who orders from an online grocer (and chooses home delivery) has a delivery box, the grocer still has to provide time windows for the customers without a delivery box. As concluded in the interviews and observations, logistics providers could gain considerable benefits if they do not have to accommodate the delivery routes to time windows. One of the benefits with not using time windows, is that it allows the logistics providers to deliver larger volumes per route. The volumes per route will then be determined by the vehicle fill rate, rather than the number of customers who ordered a delivery in a certain time window. Another benefit for the logistics

providers, is that they can design the routes to be as distance efficient as possible when they do not have to take delivery windows into consideration. The analysis of the interviews and observations has shown that these two benefits have a large impact on the delivery costs for logistics providers. Even if only a small number of customers have a delivery box, it would still facilitate the logistics provider's work, since these deliveries can be performed on any route during the day. The supplier could thereby choose to make those deliveries on the most suitable route, which both simplifies the route planning and saves time. If an online grocer were to offer this solution to their customers, it could boost their delivery efficiency significantly.

Today, many logistics providers and goods owners offer their customers a variety of delivery options, including their own delivery solutions. However, as discussed in Chapter 6, all commercial home delivery options require the customer to be home, and none of the unattended solutions enables the customer to get their goods home delivered. Interviews and observations shows that there is little to no cooperation between different logistics providers when it comes to the unattended solutions. A look at the delivery business today, where all logistics providers mostly use their own solutions, suggests that a common solution could be hard to implement. However, it is not feasible for the customer to have one delivery solution for every logistics provider standing outside their house. Both logistics providers and customers would benefit from a common solution. A common solution puts higher demands on the software system behind it, since it requires the software system to be accessible to all logistics providers. More details about the requirements for the technology and software behind this solution are discussed in Section 7.6.

One of the success factors established from the analysis in Chapter 6, state that the solution should be independent and available for all logistics providers to use. However, the proposed solution requires a sophisticated software system which demands continuous maintenance. It is therefore suggested that an independent company should design, implement and sell the delivery boxes and handle the maintenance. This, to avoid the bias it implies if the delivery box concept is owned by one logistics provider.

In the same way that the logistics providers would benefit from having many customers with a delivery box, the customers would benefit from having many logistics providers to access their delivery box. As discussed in the previous Section 7.4, a delivery box would be a somewhat costly investment for the customer. It is much more likely that the customer would be motivated to make

such an investment if the solution could be used for all their home deliveries, rather than being bound to one supplier. This way, the solution could be used to make deliveries for all type of goods that the customer orders online. The solution generates convenience and flexibility in pickup time for the customer, since it brings their delivery all the way to the door without requiring the customer to be home. The solution also facilitates the logistics providers in making faster deliveries, which is further valued by the customers. In summary, the proposed solution is dependent on a sufficiently large network, both on the customers' and the logistics providers' part, in order to bring all the expected benefits and solve the problems discussed in this master thesis. However, even during the start up phase before the network is completely built up, some benefits will still be gained for both parties.

7.6 Technology and Applications

A large part in making the delivery solution efficient and easy to use is dependent on the technology and software behind the solution. As discussed in Chapter 3, SST only increases customer satisfaction if it works smoothly and is easy to use. Additionally, one of the main purposes behind finding a new delivery solution for this research is to facilitate and increase the efficiency for home deliveries. The solution must therefore be easy to use for both customers and logistics providers. Furthermore, as one of the success factors in Chapter 6 states, the solution must keep the delivery safe from both theft and contamination. This must also be taken into consideration when designing the technology. The research in this master thesis has primarily focused on the logistics part rather than the technology and software. The following is therefore a description of how the authors' view an optimal functionality of the solution.

Each delivery box should have a unique identification number connected to the personal details and address of the owner. The delivery box solution for apartment buildings can have many registered users, since the delivery box will be shared by all the residents in the building. The box will be equipped with an electronic lock that is controlled through a smartphone application, and a built-in cooling system that can be turned on and off. All delivery boxes should be connected to a central system, which contains all information about a delivery box. The system should also be able to keep track of whether a box is empty or filled, and if the cooling system is turned on or not. Through the central system, it should be possible to

activate the cooling function in order to prepare for a delivery of groceries. All logistics providers and goods owners should be able gain access to the system in order to find out if a customer owns a delivery box. The owner or user of the delivery box and the logistics provider, will each have a version of the smartphone application connected to the delivery box. These applications will be connected to the central system. The customer version will only display the delivery box connected to that customer. The logistics providers' version will display all the delivery boxes of their customers. From the application, the customer will be able to grant access for logistics providers to unlock the box with a one-time code, in order to make a delivery. In the application it should also be possible to display the current temperature of the delivery box, and information about whether the cooling system is turned on or off.

The Registration and Order Process

When ordering a delivery box, the customer will be asked for their address and personal details. Every delivery box will have a unique identification number that is connected to the address and the customer details. Several users can be registered for the same delivery box, since the delivery stations in apartment buildings will consist of many lockers. For the villa solution, the owner registration will be done when ordering the delivery box. For apartment buildings, an owner of the box, for example the housing cooperative, will be registered at the installation. After that, the residents will be required to register as users before they can have their orders delivered to the delivery box. Owners and users will be connected to a delivery box in the central system. The authors propose that delivery and installation will be included when ordering a delivery box. This, to be able to ensure that the delivery box is correctly installed and, for villas, to make a notation in the system of where on the plot the delivery box is placed.

Ordering to a Delivery Box

Logistics providers and online grocers should be able to connect their delivery option page to the delivery box system. When a customer orders something from an online store, "get delivery to your delivery box" should be displayed as a delivery option. Assuming that the customers chooses this option, they will be asked to enter the identification number of their delivery box. If the system confirms that a delivery box with that identification number exists, the customers will be asked to identify themselves as a user of the delivery box. This can for example be done through mobile bank identification. The customer will then be given the option to choose day of delivery. When a day has been chosen, the system will check whether or not other deliveries are scheduled for that day, and determine if it is possible to make the delivery on the given day. The system will

also estimate the size of the delivery to make sure it fits in the customer's delivery box. If there is room in the delivery box and in the delivery schedule, the request will be granted. The checking for scheduled deliveries add most value to the apartment solution, where all residents in a building share a number of lockers. Therefore, there is a possibility that several deliveries have been ordered for the same day, and it is important to check whether the delivery will fit in the delivery box. This, in order to prevent that the logistics providers try to make a delivery to a full delivery box.

Delivering to a Delivery Box

On the day of delivery, when the logistics provider has set the delivery route, the route is entered into the delivery box system. Preferably, the software used to calculate the most efficient delivery route can be connected with the delivery box system, using a plug-in for an easy transfer. The delivery system will then alert the delivery boxes for the upcoming route and, if the registered delivery contains groceries, order them to turn on the cooling system. When the logistics provider arrives with the delivery, the driver uses the application and a one-time code to unlock the delivery box, place the delivery inside, and then lock the box again. The driver is responsible for checking that the cooling system is turned on and that the box keeps the correct temperature. However, it is the customer's responsibility to make sure that the delivery box is properly functioning before placing an order. The customer will receive a notification in their application, stating that their delivery has arrived and be informed of the latest pickup time. The system will register that the delivery box contains a delivery, and that no other deliveries can be made until the delivery has been picked up by the customer.

The Pickup Process

When the customer arrives home, the application is used to unlock the delivery box. If the cooling system has been turned on, it will automatically be turned off when the customer retrieves the delivery. Furthermore, the system will be notified that the delivery box is empty. At the pickup, the customer will also sign a receipt in the application that the delivery has been received. For sensitive products, such as groceries, the quality of the delivery can only be guaranteed for a certain number of hours. The latest pickup time will therefore be given to the customer in the delivery notification. After that time, the supplier can no longer guarantee that the delivered goods keep the same quality. For groceries, the latest pickup time will be up to 14 hours after the delivery has been made.

7.7 Evaluation of the Proposed Delivery Concept

The proposed delivery concept is chosen since it is assessed to fulfill the six critical success factors, established in Chapter 6. The evaluation of the delivery solution and the motivations why it is estimated to fulfill the critical success factors are presented in Table 7.3. The critical success factor that implies the highest uncertainty of whether it will be fulfilled, is critical success factor number 5; Meet the demands of both customers and logistics providers in terms of price and cost. This, due to uncertainty in whether the customers are willing to make the initial investment in a delivery box. It will be easier to motivate the customers with the possible advantages to gain from the system network if a large number of logistics providers have joined the network. However, as discussed in Chapter 6, it could be challenging to get different logistics providers to cooperate. As a result of the large potential financial savings long term, this critical success factor is assessed to be achievable as long as the customer is convinced to make the investment. Initially, from the logistics providers' perspective, the critical success factor number 5 is met in terms of lowered logistics costs from the decreasing number of customers using time windows. This simplifies the route planning and increases the delivered volumes per route.

Table 7.3. *The motivations behind the proposed delivery solution and why it is assessed to fulfill the six critical success factors.*

<i>Critical Success Factor</i>	<i>Motivation</i>
1. Be able to perform deliveries of larger volumes, meaning, more delivered orders per route.	Since the need of time windows is eliminated, it is possible to increase the delivered volumes per route and the vehicle fill rate.
2. Enable unattended home delivery.	The solution enables unattended delivery by providing SST to access the box, and a cooling system to keep the cold chain unbroken.
3. Be independent, available for all logistics providers to use.	The solution should be provided by an independent company. The delivery boxes are available for all logistics providers and goods owners that perform home deliveries.
4. Keep the cold chain unbroken until the customer comes home.	The delivery boxes are refrigerated, and keep the cold chain intact until the customer comes home.
5. Meet the demands of both customers and logistics providers in terms of price and cost.	The logistics providers will save time and money from simplified route planning. For the customers, there will be an initial investment cost. This will however be paid off in a short period of time, since deliveries to the boxes will be free of charge.
6. Keep the delivery safe from both theft and contamination.	The delivery box will be "burglarproof", since it is equipped with an electronic lock.

8 Discussion

In this chapter, the recommended solution and its features will be discussed as well as the chosen research method and how it possibly has affected the findings.

8.1 The Solution

The delivery box has been designed to provide both customers, logistics providers and goods owners with benefits, compared to existing home delivery solutions. The proposed solution requires an investment, and the recommendation is that the investment is made by the customer. A more elaborate motivation for placing the investment on the customer is presented further down this section. To convince the customer to make the investment will be a challenge, and it will take good arguments to motivate them to do so. It will be crucial to get the customers to understand the advantages of the delivery box. As presenter in Chapter 3, customer surveys suggests that many customers are price sensitive. The research of the customers' delivery current preferences, shows that many customers primarily choose a free or low cost delivery option over a more convenient one. However, the research also shows that some target groups are more price sensitive than others, and that the largest target group of online shoppers is less price sensitive. In the survey results, cost is often ranked higher than convenience. However, since cost and convenience are often put against each other, it is hard to determine the relative importance of cost. Many customers state that they shop groceries online and choose home deliveries since they find it more convenient. If there is only a small difference in cost between two options, where one is perceived as much more convenient, it is possible that even the cost conscious customers do not choose the cheapest option. This type of relative importance is however hard to investigate in the current surveys available. It is also important to acknowledge that customer surveys are based on the respondents' perceptions of their actions, and not their actual behaviors. Therefore, the responses in a survey might not always reflect the reality.

Free shipping is a marketing term and a competitive tool in the overall online business. This makes it hard for logistics providers and goods owners to charge the customers a fair price for the delivery service. The fact that it is hard to charge the customers with the actual delivery cost, is one part of the motivations behind letting the customers make the investment. Another reason for placing the investment on the customers, is the insight that in order to implement this type of solution it needs to become a market standard. If one logistics provider makes the investment for their customers, it will limit usage of the solution to that specific logistics provider, and thereby constrain many of the benefits of the solution. Even if all logistics providers would collaborate to implement the solution, they are not the only ones performing home deliveries, and therefore the solution would not be fully utilized. Additionally, it would also be hard to work out a cost structure for a shared solution that all suppliers can deliver to. Therefore, it was concluded that it would be better if the customers make the investment, and get awarded with free deliveries from the supplier.

The aim of this master thesis has been to examine the current market situation and delivery options in the online grocery industry, with the goal of finding a more efficient delivery solution. Since the focus of this thesis has been to innovate and find a new solution, improvements for the existing home delivery solutions have not been further examined. The suggested solution is designed to improve the efficiency for logistics providers and increase the customer satisfaction. These factors have been assessed to be the strongest motivating factors for finding a new delivery solution. This has been concluded from Chapter 3 and the case study findings. However, it has been concluded from the observations and the interviews, presented in Chapter 5, that this not the only way to increase efficiency for home delivery of groceries. The traditional grocery market is competitive where price and additional services, such as online sales and home delivery, are a strong competitive tools. There is little collaboration between different players in the online grocery industry and most of them handles their own home deliveries. Throughout the interviews in this master thesis, the importance of large volumes has been a common theme in the discussions on profitable home deliveries. Many logistics providers and goods owners emphasize volume as the number one key to make home deliveries less costly. The recommended solution enables the suppliers to perform a larger number of deliveries during the same route, and thereby increase the number of deliveries per time unit. However, if logistics providers and online grocers collaborated with their last-mile deliveries, a lot could be gained for all parties. A challenge stated by the authors in Chapter 6, is getting all logistics

providers and goods owners to collaborate and use a common home delivery solution, is predicted to be a considerable challenge.

The suggested solution gives the logistics providers with more time flexibility. It also enables delivery when the customer is not home. Judging by the research on customer preferences, presented in Chapter 3, this will increase the customer satisfaction for many customers. Even so, some customers might prefer morning deliveries and shorter time windows, and therefore will not appreciate that the new delivery solution does not provide an exact delivery time. In order for the delivery box to work optimally, it is dependent on new technology, such as an electronic lock and a mobile application. Based on conclusions from the customer research on SST, presented in Chapter 3, this might intimidate some customers that are not comfortable with high technology solutions.

The delivery box solution is unique in the fact that it combines unattended delivery with home delivery. Many of the unattended delivery solutions used today, require the customer to pick up the delivery at an external location. The examined delivery solutions are presented in Chapter 3. The most commonly used home delivery model today requires the customer to be home. Chapter 3 presents pilot projects for unattended home deliveries, such as in-fridge delivery, that have lately been seen in the market. The in-fridge delivery allows the driver to enter the house and put the groceries straight into the fridge. This solution requires the customer to have an electronic lock, from a certain manufacturer, on their front door. This type of project suggests an upcoming demand for new home delivery solutions, which aligns with the interview findings presented in Chapter 5. The delivery box and the in-fridge delivery have some conceptual similarities. For example, they both use an electronic lock connected to a mobile application. The delivery box, however, will be placed outside the house. This, since some customers might not be comfortable with letting a stranger enter their house when they are not home. In order for the delivery box concept to reach maturity, the authors believe that it is of great importance that the technology is accessible to everyone. This is confirmed by the critical success factor number 3; Be independent, available for all logistics providers to use, established from the analysis in Chapter 6.

During the work on this thesis, a lot of discussions have been held around whether the delivery box should be a fixed installation, or a portable solution with a return flow. There are advantages and disadvantages with both solutions. The fixed installation was chosen since it was deemed to be easier to adapt, in order to fulfill the requirements, found in Chapter 4, and the critical success factors established in Chapter 6. The return flow for the portable solution would complicate the logistics

considerably. Facilitating the logistics for goods owners and logistics providers is one of the requirements for the solution and the underlying purpose of this master thesis. Another requirement is that the delivery box must be able to keep the temperature for at least 14 hours. This requirement will be harder to implement for a portable solution since it would require a battery driven cooling system. A fixed solution can be plugged into the house electricity, in order to supply the cooling system with power. Nonetheless, a fixed installation implies challenges of its own. For apartment buildings, the placement of the box will be an important factor to consider. Many apartment buildings do not have the space to install a multi-locker delivery box in the stairwell or in other common areas. There are also strict rules and regulations concerning fire safety that must be fulfilled. One solution would be to place the delivery box outside the apartment building. Although, depending on the location of the building, this might also be too tight, for example in inner city areas. The placement challenges are however assessed to be possible to overcome. The delivery box solution for apartment buildings is flexible, and the installation can be split up in sections and spread out in the building. Notable is that the smallest section is only 60 centimeters wide. For new buildings, lack of space is not considered to be a problem since the delivery box would be introduced already at a design stage.

8.2 The Research Method

The findings in this master thesis is based on a literature review and a case study. As a part of the case study, interviews and observations were performed. The study is qualitative which means the results can reflect opinions and perceptions of single individuals. Interviews have been held and customer surveys studied as a part of the research in this thesis. From these, some of the requirements for a new solution have been drafted. However, it is a well-known fact that people do not always do what they say. When asked, they might believe they will make a certain choice but, when put in the situation, they will make a different choice. It is therefore important to be prepared to adjust the requirement specification, and be market-responsive when launching this new home delivery solution.

The study has been conducted in the southern parts of Sweden. Most of the interviews have been held in either Helsingborg or Lund, and most of the interviewees have the southern parts of Sweden as their primary work area. The observations have been made at two food stores, operating in a middle-sized town,

Lund. It is reasonable to assume that the findings in this master thesis have been influenced by the research setting. The conditions for home delivery in a larger city, such as Stockholm, are different from the settings in Lund and Helsingborg. In rural areas it is yet another situation. When applying the requirements for a home delivery solution in a different setting, this should be taken into consideration.

The master thesis has been carried out in cooperation with Nowaste. The goal has been to find a new general home delivery solution, suitable to Nowaste as well as other logistics providers. Nowaste has therefore been given much attention in the research process, and the final results does most likely reflect the perceptions of the Nowaste employees. The fact that Nowaste does not perform home deliveries of groceries today has added an extra challenge to the research, since there were no processes in place for the authors to study. The new home delivery solution is partly based on predictions for the future. This, since the concept has not been tested before, which in itself adds some uncertainty to the results.

9 Conclusion and Final Remarks

This final chapter of the master thesis report will provide answers to the RQs presented in Chapter 1. Additionally, a concluding recommendation to the case company is provided, together with a proposal for future research within the research field. The answers to the RQs, the recommendation to Nowaste, and the suggestions for future research are based on the findings from previous chapter.

9.1 Answering the Research Questions

In order to be able to fulfill the purpose of this master thesis, seven RQs were established. The aim of this section is to give concise answers to these questions. Some of them, however, are difficult to give short and summarizing answers to, and references to the report will therefore be used as a complement.

RQ 1. What delivery solutions are currently seen in the market for e-groceries?

In order to answer RQ 1, a literature review and a case study were performed to find available delivery solutions in the market. In the Swedish market, there are currently six possible ways to either collect or have the groceries delivered. The literature review showed that four out of six available delivery options demands human interaction. The solutions that currently demands human interaction is delivery to a collection point, order online and pick up in store (Click & Collect), attended home delivery, and delivery through a bike courier. Remaining two is delivery to parcel lockers and unattended home deliveries. For the observations, performed at the online grocers within the case study, attended home deliveries and deliveries to parcel lockers were studied. See Chapter 3 (Section 3.3.1) and Chapter 5 (Section 5.1.2).

RQ 2. What conditions are required in the solution considering food product requirements of transporting chilled and frozen food?

As in the case of RQ 1 above, RQ 2 has been answered based on the findings from the literature review and the case study. The research has shown that the delivery solution must be able to keep the cold chain unbroken until the customer comes home. According to the national guidelines, that means a maximum temperature of -18 °C for frozen food, with a temperature reserve of between 2 °C and 7 °C. For chilled animal products, the solution must be able to keep maximum +2 °C, with a temperature reserve of 2 °C. There are no specific temperature requirements for chilled vegetable products in the national guidelines, rather than to consider the temperature sensitivity of the products. The findings from the case study has shown that bananas and basil are examples of extra sensitive vegetable products. According to the national guidelines, the individual temperature requirements must be fulfilled when transporting different food products together.

When the interviews and observations are conducted, the results show that the national guidelines are not applied when transporting mixed grocery bags. Instead, only the frozen items are separated from the cooled, temperature sensitive, and the non-temperature sensitive items. The common temperature for the mixed grocery bags differ between the different logistics providers, but the refrigerated temperature is set between +2 °C and +8 °C. To note is that the national guidelines are currently formulated to suit the traditional bulk deliveries. When the e-grocery industry continues to grow, and especially the demand for mixed grocery bags, it might be that the national guidelines will be adapted to better suit this market as well. With or without regulations, it has been concluded that the required conditions for the solution is that it must be able to keep one common refrigerated temperature zone and one frozen temperature zone. See Chapter 4 (Section 4.1) and Chapter 5 (Section 5.1).

RQ 3. What are the logistical requirements that has to be fulfilled, in terms of cost, flexibility, quality and time, for the solution to be efficient?

As established in the critical success factors, presented in Chapter 6, the solution must be able to meet the demands of both customers and logistics providers in terms of price and cost. The findings in Chapter 5 has shown that volumes are needed in order to be able to perform deliveries cost effectively. To gain large volumes, a network of users and suppliers are needed. Hence, in terms of cost; a network of users and suppliers are needed in order to obtain large volumes and cost effectiveness within the system. As the number of suppliers that offer delivery to delivery boxes increases, it will be easier to motivate the customers of the

potential benefits of buying a delivery box. For the logistics providers, cost savings are possible to obtain already at an early stage, since a decreasing number of customers using time windows will simplify the route planning and increase the vehicle fill rates. However, the higher the number of delivery boxes within the system, the higher the cost savings for logistics providers. The key to obtain a network of users, enabling large delivered volumes within the system in the long run, will therefore be to start convincing the logistics providers of the potential advantages of joining the network. Thereafter, it will be easier to persuade the customers to buy a delivery box.

Furthermore, to gain volumes and cost effectiveness, the system must give the logistics providers time flexibility. From a logistics perspective, that means the possibility to plan the routes without the need to take time windows into account. Hence, in terms of time flexibility; the logistics providers must be able to deliver the groceries independently, without consideration to when the customers are home. To ensure the quality of the goods, the cold chain must be kept unbroken through the product lifecycle. For the logistical requirements to fulfill this, see the answer to the previous RQ 2. Assuming that the transported volumes would grow, the secondary packaging will become critical in order to ensure quality. This, since the level of stackability and stability could have a direct affect on the quality in terms of bumped or broken products. In summary, an unbroken cold chain and stable loading during transportation is required in terms of quality. Furthermore, one of the findings from the interviews was that the time spent per delivery will be crucial to minimize in order to find cost effectiveness. If flexibility and a large delivery network would be realized, and volumes accordingly, this would cut the time spent per delivery. Hence, in terms of time; if the logistical requirements in terms of cost and flexibility would be fulfilled, the time requirements needed for the solution to perform efficiently would be met as well.

RQ 4. For the proposed solution, what type of technology is required?

The technology required for the delivery solution is founded on a central system network. This system will be connected to a mobile application and an electronic lock, used to open and close the delivery boxes. The mobile application will come in two different versions, one for the logistics providers and one for the customers. The logistics providers need the mobile application to get their delivery routes and to open the delivery boxes. To do this, an one-time code will be provided when the customer has granted access. In the customer version of the application, the users will get a notification when the delivery has been completed, together with the latest pickup time. The central system will keep track of the users' personal details and addresses. It will also contain all registered delivery boxes, their unique

identification numbers, and the occupation of the delivery boxes. The technology, and its features, are thoroughly presented in Chapter 7 (Section 7.6).

RQ 5. What consumer preferences are there for home delivery of groceries?

When analyzing the consumer preferences in Chapter 3, some fundamental trends were identified among the customer surveys. These trends were summarized in three key takeaways, see the list below. The results showed that the majority of customers, 70 percent, prefer the cheapest form of delivery. But of the remaining 30 percent, 23 percent choose same day deliveries regardless of what it would cost them. This led up to the key takeaway that customers value speed deliveries, for example same-day or instant deliveries. The third key takeaway was that customers value convenience and want deliveries to, for them, convenient locations such as home, the office, or a parcel locker at the train station. The full review of the consumer preferences for home delivery of groceries is presented in Chapter 3 (Section 3.4).

- **Willingness to pay.** *The majority of customers will choose the cheapest form of delivery.*
- **Convenience.** *Customers want deliveries to locations they find convenient, such as home, the office or a parcel locker on the train station.*
- **Speed.** *Customers value speed deliveries, for example same-day or instant deliveries.*

RQ 6. What are the requirements for the solution from the customer's perspective?

Aside from what the consumers prefer when it comes home delivery of groceries, there are some other aspects that are required. These aspects have a slightly different focus; rather than targeting what the customers prefer, they are addressing what is actually needed in order to be able to sell the delivery boxes. This led up to three key takeaways, concluded from the theory, that mainly addresses the quality of the goods, and protection against theft and contamination. From a customer perspective, the most critical part of keeping the quality of the groceries is to keep the cold chain unbroken, in order to prevent bacterial growth. Furthermore, the delivery solution is required to keep the groceries safe from both theft and contamination, in order to convince the customers of the value it could contribute with.

- **Managing the cold chain and the different temperature requirements** *is the single most challenging and critical part of delivering groceries.*

- **Protection against theft.** *An unattended delivery solution requires protection against theft.*
- **Risk of contamination.** *If the groceries are to be left unattended outside of peoples' homes, there is always a risk that the food will be contaminated.*

RQ 7. What are the critical success factors for home delivery solutions?

The following six critical success factors were obtained through the analysis of this study. The critical success factors are general for all home delivery solutions and are not only applicable if Nowaste would develop a new home delivery solution.

1. Be able to perform deliveries of larger volumes, meaning, more delivered orders per route.
2. Enable unattended home delivery.
3. Be independent, available for all logistics providers to use.
4. Keep the cold chain unbroken until the customer comes home.
5. Meet the demands of both customers and logistics providers in terms of price and cost.
6. Keep the delivery safe from both theft and contamination.

9.2 Recommendations to Nowaste Logistics

The authors recommend Nowaste to further investigate the delivery box solution, in order to reach a conclusion of whether it will be a successful implementation. The recommended solution has been developed to solve some of the most critical problems in the last-mile logistics, presented in Chapter 5 and 6. One of the specifications from the case company was that it should be possible to implement the solution as soon as possible. Even though the goal has been to accomplish this, there might be some challenges. The next step for Nowaste is therefore to further investigate the recommended solution and its practicalities. For example, some issues regarding how much space the boxes would require in the apartment building common areas need to be examined. It is also critical to make sure that the solution fulfills fire safety law and regulations, which was further elaborated on in the previous chapter. In order to perform a successful implementation, the company must also investigate how electricity should be provided to the delivery boxes. Since the recommendation is to include installation in the offer to

customers, the company must be able to ensure that these operations run smoothly, with no complications due to plug in difficulties.

Furthermore, Nowaste must reach a conclusion of whether or not they should start a new company running the delivery box business. One large challenge this affiliate would face, is how to get all the logistics providers to cooperate and convince them about the potential benefits of joining the network. Nowaste is also recommended to investigate whether or not new legislations, adapted to suit mixed grocery bags rather than the traditional bulk deliveries, will be founded. Since the current guidelines are not adapted to suit mixed grocery bags, these are not always applicable. Instead, the solution has been developed in line with how grocery bags are currently transported; in one common refrigerated temperature with a separate section for the frozen food. But if the legislations change, and the guidelines get stricter, this must be considered when the delivery boxes are to be developed.

A final recommendation to Nowaste is to perform market research and calculations on what it would cost to manufacture the product. This, in order to be able to set a fixed price for the different delivery box offers. As discussed in Chapter 7, since the purpose of the thesis primarily has been to develop a conceptual delivery solution, no profound calculations on what it would cost to produce the product have been made. Therefore, this would be an important investigation for the company to perform, in order to be able to develop the delivery boxes. If all of the recommended next steps are taken by Nowaste, and it is concluded that it would result in a successful implementation, the authors recommend the case company to bring the product to market.

9.3 Future Research

This master thesis contributes with an understanding of existing challenges in the last-mile logistics, the e-grocery business, and of performing home deliveries of mixed grocery bags. Even though the project has been carried out at Nowaste, several interviews and observations have been conducted outside of the organization. This provides the reader with characteristics of transporting groceries not only in one specific case, but in several different settings. The authors find that this has enabled a wide perspective of the activities within the last mile of groceries, and best practices there within. Since the study examines the drawbacks within the last mile, the ambition has been to increase the limited

knowledge in how to transform the non-profitable business of delivering groceries to a thriving, lucrative business.

Since the findings have not been collected exclusively from Nowaste and cover general issues and drawbacks in the last mile, it has been possible to develop a versatile delivery solution, available for all logistics providers performing home deliveries. Furthermore, the master thesis provides a holistic view of the current situation in the Swedish e-grocery market, including a presentation of the results from a number of customer surveys. This implies that even separate parts of the master thesis can provide value to reader. The critical success factors are general, and are useful to all readers interested in delivering groceries ordered online. Additionally, the authors hope that the insight of the potential benefits if all logistics providers cooperate, reaches the reader.

For further knowledge within the investigated area, it is recommended to continue the analysis of the delivery box solution. For example, it is proposed to do a study of how long a mixed grocery bag would cope in a refrigerated box, before the quality is affected. It is also recommended to investigate how well the delivery boxes would serve other products outside of the grocery business. This, since the research do not cover other products than groceries, and has been limited to the e-grocery market for mixed grocery bags in particular. This could imply that some features, for example the measurements of the delivery box, would need to be adjusted to better suit other products. Furthermore, the research has excluded deliveries of cooked meals from restaurants etcetera. A next step for future research could therefore be to investigate whether it is possible to adjust the boxes for products that should be kept at warmer temperatures as well. For example, if it would be possible for customers to order a hot meal on their way home from work. In that case, the food needs to be kept warm for approximately 30 minutes until the customer arrives home. The solution has been limited to suit the Swedish market, but the data gathering has exclusively been carried out in the southern part of Sweden, more specifically in Helsingborg and Lund. Introducing pilot projects in other parts of Sweden, preferably in both urban and rural areas, is therefore recommended in order to gain a better understanding of how the solution would perform in different environments. By applying the results and test the recommended solution in other businesses and settings, an understanding of the transferability of the results would be gained.

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Appendix

In this chapter, the appendices of the master thesis report will be presented.

Appendix A

Interview Guide, Nowaste Top Management Executives

This appendix displays the interview guide in Swedish used during the interviews with top management executives at Nowaste (CEO and Vice president).

Personliga frågor

- Hur länge har du jobbat på Nowaste?
- Vad är din roll på Nowaste?
- Vilka är dina ansvarsområden?
- Hur länge har du haft den positionen du har nu?
- Har du haft någon annan position inom företaget tidigare?

Strategi och verksamhetsutveckling

- Vad skulle du säga är företagets övergripande strategi?
 - Vilka tjänster erbjuder Nowaste?
- Hur skulle du beskriva företagets processer?
 - Vilken del av värdekedjan ansvarar ni för?
- Hur konkurrerar ni gentemot era konkurrenter?
 - Har ni en nisch?
- Finns det ett gemensamt mål som alla medarbetare inom Nowaste strävar mot?
- Hur arbetar ni med att utveckla verksamheten?
 - Hur stor del av detta arbetet är medarbetarna delaktiga i?
- Vad är den bakomliggande motivationen för Nowaste att undersöka hemleveranser av matvaror?

- Har ni märkt av den ökade andelen köp på nätet?
 - Hur har det påverkat er verksamhet?
 - Har detta motiverat er till att undersöka hemleveranser?
- Har ni sett ett behov utav flera kanaler till kund?
- Finns det andra planer på att utöka antalet kanaler mot kund?

Kunder

- Hur skulle du beskriva era kunder?
- Vad anser du att era kunder efterfrågar mest?
- Vad anser du är det största problemet för era kunder?

Förpackning

- Hur är de matvaror ni levererar idag förpackade?
- Hur är förpackningen utformad för att minimera skador på produkterna?
- Vilka problem upplever ni idag med att transportera matvaror?
 - Hur hanterar ni dessa problem?
- Hur kommer matvarorna att förpackas om ni börjar med hemleveranser?

Hemleveranser

- Hur upplever du marknaden för hemleveranser av matvaror?
- Vad anser du är den största utmaningen med last-mile logistics?
 - Vad anser du är den största utmaningen med att göra hemleveranser?
 - Vad anser du är den största utmaningen med att leverera matvaror?
- Hur ser du att man skulle lösa problemet med att uppfylla temperaturkrav vid samlastning på bästa möjliga sätt?
- Hur tänker du att en 24/7/365 upphämtning/leverans-lösning skulle utformas på bästa sätt?
 - Hur viktigt är det att kunderna kan hämta upp sina varor 24/7/365?
- Låt säga att vi skulle utveckla en leveranslösning som innebär att kunderna kan hämta upp sina varor 24/7, vilket tidsspann är rimligt att man ger kunden att hämta upp sina varor?
 - Dvs, hur länge ska lösningen kunna hålla temperaturkraven?
- Låt säga att lösningen kommer innebära något skåp/låda eller dyl, hur optimerar man storleken på dessa?
 - Hur många matkassar ska den rymma?

- Har du några tankar kring hur man skulle kunna säkerställa inbrottssäkerheten för en unattended delivery solution?
 - Vad tänker du när man säger inbrottssäkert system?
- Vilka är enligt dig de viktigaste faktorerna som en hemleveranslösning måste uppfylla?
- Vilka är dina förväntningar på hur en hemleveranslösning på Nowaste skulle utformas?
 - Vilka problem förväntar du dig att den löser?
- Vilka fördelar förväntar du dig att Nowaste kommer få gentemot sina konkurrenter genom att implementera en ny leveranslösning?
- Om Nowaste skulle börja med hemleveranser av matvaror, hur skulle det påverka ditt arbete?
- Hur tror du att man kommer leverera matvaror i framtiden?
 - Om ca 30 år
- Har du några fler tankar kring hur ett nytt leveranssystem skulle utformas?

Faktorer - ranka följande faktorerers betydelse för leveranslösningen

- Enkel ruttplanering
- Optimerad fyllnadsgrad genom staplingsbar sekundärförpackning
- Möjlighet för kunden att få varorna levererade 24/7
- Anpassningsbarhet till olika produkter med olika krav
- Säkerhet (inbrott)
- Skalbarhet

Faktorer - ranka följande faktorerers betydelse för slutkunden

- Kostnad
- Bekvämlighet
- Snabbhet

Faktorer - ranka följande faktorerers betydelse för Nowaste

- Kostnad för implementation
- Kort process fram till uppstart
- Tillgänglig teknologi
- Unikhet

Kontaktförslag

- Har du tips på andra personer vi kan tala med för mer information på ämnet?

Appendix B

Interview Guide, Nowaste Transport Managers

This appendix displays the interview guide in Swedish used during the interviews, conducted in Swedish, with transport managers at Nowaste.

Personliga frågor

- Vad är din roll på Nowaste?
- Vilka är dina ansvarsområden?
- Hur länge har du jobbat på Nowaste?
- Hur länge har du haft den positionen du har nu?
- Har du haft någon annan position inom företaget tidigare?

Strategi och verksamhetsutveckling

- Vad skulle du säga är företagets övergripande strategi?
 - Vilka tjänster erbjuder Nowaste?
- Hur skulle du beskriva företagets processer?
 - Vilken del av värdekedjan ansvarar ni för?
- Hur konkurrerar ni gentemot era konkurrenter?
 - Har ni en nisch?
- Upplever du att det finns ett gemensamt mål som alla medarbetare inom Nowaste jobbar och strävar efter?
 - Vad är detta mål?
- På vilken nivå upplever du att man tar in medarbetare för att bidra till företagets verksamhetsutveckling?
 - Tar man tillvara på medarbetares idéer och tankar för förbättring?
- Har ni märkt av den ökade andelen köp på nätet?
 - Hur har det påverkat er verksamhet?
- Har ni sett ett behov utav flera kanaler till kund?

Kunder

- Hur skulle du beskriva era kunder?
- Vad anser du att era kunder efterfrågar mest?
- Vad anser du är det största problemet för era kunder?

Förpackning

- Hur är de matvaror ni levererar idag förpackade?

- Hur är förpackningen utformad för att minimera skador på produkterna?
- Vilka problem upplever ni idag med att transportera matvaror?
 - Hur hanterar ni dessa problem?
- Hur kommer matvarorna att förpackas om ni börjar med hemleveranser?

Logistik

- Vilka aktiviteter/processer ansvarar din avdelning för?
- Hur mycket arbetar din avdelning med själva transporten?
- Hur sker samarbetet med andra avdelningar?
- Vilken information delas mellan avdelningar?
- Hur märker ni av den ökade andelen hemleveranser?
- Var finns det utrymme för förbättring i värdekedjan?

Hemleveranser

- Hur upplever du marknaden för hemleveranser av matvaror?
- Vad anser du är den största utmaningen med last-mile logistics?
 - Vad anser du är den största utmaningen med att göra hemleveranser?
 - Vad anser du är den största utmaningen med att leverera matvaror?
- Hur ser du att man skulle lösa problemet med att uppfylla temperaturkrav vid samlastning på bästa möjliga sätt?
- Hur tänker du att en 24/7/365 upphämtning/leverans-lösning skulle utformas på bästa sätt?
 - Hur viktigt är det att kunderna kan hämta upp sina varor 24/7/365?
- Låt säga att vi skulle utveckla en leveranslösning som innebär att kunderna kan hämta upp sina varor 24/7, vilket tidsspann är rimligt att man ger kunden att hämta upp sina varor?
 - Dvs, hur länge ska lösningen kunna hålla temperaturkraven?
- Låt säga att lösningen kommer innebära något skåp/låda eller dyl, hur optimerar man storleken på dessa?
 - Hur många matkassar ska den rymma?
- Har du några tankar kring hur man skulle kunna säkerställa inbrottssäkerheten för en unattended delivery solution?
 - Vad tänker du när man säger inbrottssäkert system?
- Vilka är enligt dig de viktigaste faktorerna som en hemleveranslösning måste uppfylla?

- Vilka är dina förväntningar på hur en hemleveranslösning på Nowaste skulle utformas?
 - Vilka problem förväntar du dig att den löser?
- Vilka fördelar förväntar du dig att Nowaste kommer få gentemot sina konkurrenter genom att implementera en ny leveranslösning?
- Om Nowaste skulle börja med hemleveranser av matvaror, hur skulle det påverka ditt arbete?
- Hur tror du att man kommer leverera matvaror i framtiden?
 - Om ca 30 år
- Har du några fler tankar kring hur ett nytt leveranssystem skulle utformas?

Faktorer - ranka följande faktorerers betydelse för leveranslösningen

- Enkel ruttplanering
- Optimerad fyllnadsgrad genom staplingsbar sekundärförpackning
- Möjlighet för kunden att få varorna levererade 24/7
- Anpassningsbarhet till olika produkter med olika krav
- Säkerhet (inbrott)
- Skalbarhet

Faktorer - ranka följande faktorerers betydelse för slutkunden

- Kostnad
- Bekvämlighet
- Snabbhet

Faktorer - ranka följande faktorerers betydelse för Nowaste

- Kostnad för implementation
- Kort process fram till uppstart
- Tillgänglig teknologi
- Unikhet

Kontaktförslag

- Har du tips på andra personer vi kan tala med för mer information på ämnet?

Appendix C

Interview Guide, Nowaste Business Development Manager

This appendix displays the interview guide used during the interviews with the business development manager at Nowaste. Since the interviews were conducted in Swedish, the interview guide is provided in Swedish.

Personliga frågor

- Vad är din position på företaget?
- Vilka är dina ansvarsområden?
- Är du anställd av både Bolist och Nowaste?
- Om ja; är det en eller två tjänster?
- Hur länge har du haft den positionen du har nu?
- Har du haft någon annan position inom företaget tidigare?

Strategi och verksamhetsutveckling

- Vad skulle du säga är företagets övergripande strategi?
 - Vilka tjänster erbjuder Nowaste?
- Hur skulle du beskriva företagets processer?
 - Vilken del av värdekedjan ansvarar ni för?
- Hur konkurrerar ni gentemot era konkurrenter?
 - Har ni en nisch?
- Upplever du att det finns ett gemensamt mål som alla medarbetare inom Nowaste jobbar och strävar efter?
 - Vad är detta mål?
- På vilken nivå upplever du att man tar in medarbetare för att bidra till företagets verksamhetsutveckling?
 - Tar man tillvara på medarbetarnas idéer och tankar för förbättring?
- Har ni märkt av den ökade andelen köp på nätet?
 - Hur har det påverkat er verksamhet?
- Har ni sett ett behov utav flera kanaler till kund?

Kunder

- Hur skulle du beskriva era kunder?
- Vad anser du att era kunder efterfrågar mest?

- Vad anser du är det största problemet för era kunder?

Logistik

- Vilka aktiviteter/processer ansvarar din avdelning för?
- Hur mycket arbetar din avdelning med själva transporten?
- Hur sker samarbetet med andra avdelningar på Nowaste?
 - Vilken information delas mellan avdelningar?
- Hur märker ni av den ökade andelen hemleveranser?
- Var finns det utrymme för förbättring i värdekedjan?

Hemleveranser

- Hur upplever du marknaden för hemleveranser av matvaror?
- Vad anser du är den största utmaningen med last-mile logistics generellt?
 - Vilka är de största kostnaderna?
 - Vilka förbättringsmöjligheter finns?
- Vad anser du är den största utmaningen med last-mile logistics för matvaror?
- Hur ser du att man skulle lösa problemet med att uppfylla temperaturkrav vid samlastning på bästa möjliga sätt?
- Hur tänker du att en 24/7/365 upphämtning/leverans-lösning skulle utformas på bästa sätt?
 - Hur viktigt är det att kunderna kan hämta upp sina varor 24/7/365?
- Låt säga att vi skulle utveckla en leveranslösning som innebär att kunderna kan hämta upp sina varor 24/7, vilket tidsspann är rimligt att man ger kunden att hämta upp sina varor?
 - Dvs, hur länge ska lösningen kunna hålla temperaturkraven?
- Låt säga att lösningen kommer innebära något skåp/låda eller dyl, hur optimerar man storleken på dessa?
 - Hur många matkassar ska den rymma?
- Har du några tankar kring hur man skulle kunna säkerställa inbrottssäkerheten för en unattended delivery solution?
 - Vad tänker du när man säger inbrottssäkert system?
- Vilka är enligt dig de viktigaste faktorerna som en hemleveranslösning måste uppfylla?
- Vilka är dina förväntningar på hur en hemleveranslösning på Nowaste skulle utformas?
 - Vilka problem förväntar du dig att den löser?

- Vilka fördelar förväntar du dig att Nowaste kommer få gentemot sina konkurrenter genom att implementera en ny leveranslösning?
- Om Nowaste skulle börja med hemleveranser av matvaror, hur skulle det påverka ditt arbete?
- Hur tror du att man kommer leverera matvaror i framtiden?
 - Om ca 30 år
- Har du några fler tankar kring hur ett nytt leveranssystem skulle utformas?

Faktorer - ranka följande faktorerers betydelse för leveranslösningen

- Enkel ruttplanering
- Optimerad fyllnadsgrad genom staplingsbar sekundärförpackning
- Möjlighet för kunden att få varorna levererade 24/7
- Anpassningsbarhet till olika produkter med olika krav
- Säkerhet (inbrott)
- Skalbarhet

Faktorer - ranka följande faktorerers betydelse för slutkunden

- Kostnad
- Bekvämlighet
- Snabbhet

Kontaktförslag

- Har du tips på andra personer vi kan tala med för mer information på ämnet?

Appendix D

Interview Guide, Logistics Providers

This appendix displays the interview guide used during the interviews with the logistics providers (DB Schenker, Bring and Rolf Viebkes Åkeri). Since the interviews were conducted in Swedish, the interview guide is provided in Swedish.

Personliga frågor

- Vad är din position på företaget?
- Vilka är dina ansvarsområden?
- Hur länge har du haft den positionen du har nu?
- Har du haft någon annan position inom företaget tidigare?

Verksamhet

- Vilken del av värdekedjan erbjuder ni tjänster för?
- Hur konkurrerar ni gentemot era konkurrenter?
 - Har ni en nisch?
- Har ni märkt av den ökade andelen köp på nätet?
 - Hur har det påverkat er verksamhet?
- Har ni sett ett behov utav flera kanaler till kund?
- Finns det planer på att utöka antalet kanaler mot kund?

Kunder

- Hur skulle du beskriva era kunder?
- Vad anser du att era kunder efterfrågar mest?
- Vad anser du är det största problemet för era kunder?

Förpackning

- Levererar ni matvaror idag?
 - Hur är dessa i så fall förpackade?
- Hur är förpackningen utformad för att minimera skador på produkterna?
- Vilka problem upplever ni idag med att transportera matvaror?
 - Hur hanterar ni dessa problem?

Hemleveranser

- Hur upplever du marknaden för hemleveranser av matvaror?
- Vad anser du är den största utmaningen med last-mile logistics generellt?
 - Vilka förbättringsmöjligheter finns?

- Vad anser du är den största utmaningen last-mile logistics för matvaror?
 - Vad är den största kostnaden?
- Hur ser du att man skulle lösa problemet med att uppfylla temperaturkrav vid samlastning på bästa möjliga sätt?
- Hur tänker du att en unattended delivery solution (dvs kunden behöver inte vara hemma vid leverans) skulle utformas på bästa sätt?
 - Hur viktigt är det att kunderna kan hämta upp sina varor 24/7/365?
- Låt säga att vi skulle utveckla en unattended delivery solution som innebär att kunderna får en större frihet att hämta upp varorna när det passar dem, vilket tidsspänn är det då rimligt att man ger kunden att hämta upp sina varor?
 - Dvs, hur länge ska lösningen kunna hålla temperaturkraven?
- Låt säga att lösningen kommer innebära något skåp/låda eller dyl, hur optimerar man storleken på dessa?
- Hur många matkassar ska den rymma?
- Har du några tankar kring hur man skulle kunna säkerställa inbrottssäkerheten för en unattended delivery solution?
- Vad tänker du när man säger inbrottssäkert system?
- Vilka är enligt dig de viktigaste faktorerna som en hemleveranslösning måste uppfylla?
- Låt säga att vi skulle utveckla en unattended delivery solution för matvaror - vilka möjliga konkurrensfördelar ser du att man skulle kunna få?
- Om Nowaste skulle börja med hemleveranser av matvaror, hur skulle det påverka ditt arbete/ditt företag?
- Hur tror du att man kommer leverera matvaror i framtiden?
- Om ca 30 år
- Har du några fler tankar kring hur ett nytt leveranssystem skulle utformas?

Faktorer - ranka följande faktorerers betydelse för leveranslösningen

- Enkel ruttplanering
- Optimerad fyllnadsgrad genom staplingsbar sekundärförpackning
- Möjlighet för kunden att få varorna levererade 24/7
- Anpassningsbarhet till olika produkter med olika krav
- Säkerhet (inbrott)
- Skalbarhet

Faktorer - ranka följande faktorerers betydelse för slutkunden

- Kostnad
- Bekvämlighet
- Snabbhet

Kontaktförslag

- Har du tips på andra personer vi kan tala med för mer information på ämnet?

Appendix E

Interview Guide, Online Grocers

This appendix displays the interview guide used during the interviews with the online grocers (Mathem and ICA). Since the interviews were conducted in Swedish, the interview guide is provided in Swedish.

Personliga frågor

- Namn?
- Vad är din roll i organisationen?
- Hur länge har du arbetat där?

Utbud och efterfrågan

- Hur mycket försäljning har ni online?
- Säljer ni mest färdiga matkassar eller lösplock?
- Vad kostar mest för er, färdiga matkassar eller lösplock?
- Erbjuder alla ICA butiker online shopping? Om inte hur avgörs vilka som gör det?

Leverans

- Vilka leveransalternativ erbjuder ni?
- Hur stor del av online beställningarna levereras med hemleveranser?
- Hur stor andel motsvarar de andra leveransalternativen?
- Hur långt tid innan leveransen måste kunderna göra sin beställning?
- Hur har ni valt de tidsspänn för hemleverans som ni erbjuder kunderna idag?
- Hur många hemleveranser gör ni i snitt per vecka?
 - mån 46+15 tis 35 ons 46 tors 44 fre 36
- Hur många hemleveranser gör ni i snitt per körning?
 - 15 kunder per rutt
- Gör ni era hemleveranser själv eller använder ni er av en tredje part?
 - Om tredje part; hur fungerar samarbetet och kommunikationen er emellan?
 - Är bilarna anpassade efter varornas temperaturkrav?
- Hur stort geografiskt område täcker hemleveranser från er butik?
- Vad händer om kunden inte är hemma vid hemleverans?

- Hur är varorna förpackade vid hemleverans?
- Hur ofta blir hemleveranser försenade?
- Finns det ett maxantal som kan välja leverans i samma tidsfönster?
- Vilka är de största kostnaderna vid hemleverans?
 - Vem täcker dessa kostnader?

Reflektioner

- Vad är den största anledningen till att ICA har börjat med hemleveranser?
- Vad har ni fått för reaktioner från kunderna gällande hemleveranser?
- Vilka tycker ni är de största problemen med att göra hemleveranser idag?
- Har ni några tankar om hur ni skulle kunna effektivisera hemleveranser i framtiden?
- Skulle det finnas möjlighet för oss att åka med och observera en hemleverans?

Appendix F

Interview Guide, Other Organizations

This appendix displays the interview guide used during the interviews with the other organizations (the self-employed chef and Konsumentföreningen Stockholm). Since the interviews were conducted in Swedish, the interview guide is provided in Swedish.

Personliga frågor

- Vill du beskriva vad du arbetar med?
- Hur länge har du arbetat med det du gör nu?
- Har du haft något annat arbete tidigare?
- Hur mycket kommer du i ditt dagliga arbete i kontakt med hemleveranser av matvaror?

Kanaler

- Märker du av den ökade andelen köp på nätet i ditt arbete?
 - Påverkar det ditt arbete på något sätt?
- Har du sett ett behov utav flera kanaler till kund?

Hemleveranser

- Hur upplever du marknaden för hemleveranser av matvaror?
 - Vilka trender ser du inom marknaden för hemleveranser?
- Vad anser du är den största utmaningen med last-mile logistics?
 - Vad anser du är den största utmaningen med att leverera matvaror?
- Hur ser du att man skulle lösa problemet med att uppfylla temperaturkrav vid samlastning på bästa möjliga sätt?
- Hur tänker du att en 24/7/365 upphämtning/leverans-lösning skulle utformas på bästa sätt?
 - Hur viktigt är det att kunderna kan hämta upp sina varor 24/7/365?
- Låt säga att vi skulle utveckla en leveranslösning som innebär att kunderna kan hämta upp sina varor 24/7, vilket tidsspann är rimligt att man ger kunden att hämta upp sina varor?
 - Dvs, hur länge ska lösningen kunna hålla temperaturkraven?

- Låt säga att lösningen kommer innebära något skåp/låda eller dyl, hur optimerar man storleken på dessa?
 - Hur många matkassar ska den rymma?
- Har du några tankar kring hur man skulle kunna säkerställa inbrotts säkerheten för en unattended delivery solution?
 - Vad tänker du när man säger inbrotts säkert system?
- Vilka är enligt dig de viktigaste faktorerna som en hemleveranslösning måste uppfylla?
- Vem ska betala för en sån här typ av lösning?
- Låt säga att vi skulle utveckla en leveranslösning som innebär att kunden inte behöver vara hemma vid sin leverans av matvaror - vilka möjliga konkurrens fördelar ser du att man skulle kunna få?
- Hur tror du att man kommer leverera matvaror i framtiden?
 - Om ca 30 år
- Har du några fler tankar kring hur ett nytt leveranssystem skulle utformas?

Faktorer - ranka följande faktorer betydelse för leveranslösningen

- Enkel ruttplanering
- Optimerad fyllnadsgrad genom staplingsbar sekundärförpackning
- Möjlighet för kunden att få varorna levererade 24/7
- Anpassningsbarhet till olika produkter med olika krav
- Säkerhet (inbrott)
- Skalbarhet

Faktorer - ranka följande faktorer betydelse för slutkunden

- Kostnad
- Bekvämlighet
- Snabbhet

Kontaktförslag

- Har du tips på andra personer vi kan tala med för mer information på ämnet?

Appendix G

The Grouping of Key Takeaways and the Five Themes

This appendix presents the five themes and what key takeaways from the interviews and theory that are incorporated in every theme. This is a result of the coding process within Grounded Theory. The grouping results in only two key takeaways that are not included in the selected categories, see the bottom of this appendix.

Theme 1: Small volumes

Key takeaways from interviews

- **Speed deliveries.** *Customers within the e-commerce industry wants shorter and shorter lead times, from ordering the products online until time of delivery.*
- **Volume** *is needed in order to perform cost effective last-mile deliveries.*
- **Small volumes** *are the new standard that comes with last-mile logistics, which challenges the traditional B2B, bulk deliveries.*

Key takeaways from theory

- **Secondary packaging critical.** *From a logistics perspective the secondary packaging is critical, since its level of stackability has a direct effect on the vehicle fill rate.*

Theme 2: Need for a market standard

Key takeaways from interviews

- **Freedom to choose:** *it must be possible for customers to choose what delivery option that suits them best.*
- **The solution must perform independently** *with no stakeholders among goods owners and logistics providers; all must be able to use it for delivery to their customers.*
- **Higher demands on logistics providers and their drivers,** *who must be able to handle not only port-to-port deliveries, but all challenges that comes with last-mile logistics.*
- **Unattended delivery:** *the customers should not have to be home to receive their groceries. On long term, it is not viable to individualize all deliveries.*

- **Niched deliveries.** *A trend in the online grocery market is producers performing home deliveries or offering pick up directly to the customers in the vicinity.*
- **Expanded offers.** *The limit for logistics providers and what they are able to offer their customers continuously stretches. This goes from the loading at terminals to the unloading stage at customer sites.*
- **Simplicity:** *it must be simple for both customers and logistics providers to use the delivery solution.*

Key takeaways from theory

- **SST.** *Enables the customer to decide when to pick up their groceries, which increases customer satisfaction.*
- **Demand for new delivery solutions.** *None of the existing delivery solutions manage to optimize both customer satisfaction and cost effectiveness for the provider.*
- **Convenience.** *Customers want deliveries to, for them, convenient locations such as home, the office or a parcel locker on the train station.*
- **Speed.** *The majority of customers value speed deliveries, for example same-day or instant deliveries.*

Theme 3: Perishable nature of food products

Key takeaways from interviews

- **Managing the cold chain and the different temperature requirements** *is the single most challenging and critical part of delivering groceries.*
- **Food quality.** *The delivered food must keep a high quality and the quality must not be affected during the delivery.*

Key takeaways from theory

- **Managing the cold chain and the different temperature requirements** *is the single most challenging and critical part of delivering groceries.*

Theme 4: Cost structure

Key takeaways from interviews

- **Cost effectiveness.** *It is currently hard for companies to make profit of their e-grocery sales.*
- **Time spent per delivery** *will be crucial to minimize in order to find cost effectiveness.*

- **Compete with price.** *The grocery industry compete with pricing which makes it hard to charge enough to cover the additional costs that home deliveries bring and still be competitive.*

Key takeaways from theory

- **Transportation costs.** *In a market with low-value products, transportation costs associated with the delivery to the end-customer, have a big influence on competitiveness.*
- **Competitive market with small margins.** *The Swedish e-grocery market has many players and small profit margins.*
- **Competitive advantage.** *Competitive advantage in the e-grocery market is gained by cost effective purchasing and logistics strategies.*
- **Willingness to pay.** *The majority of customers will choose the cheapest form of delivery.*

Theme 5: Responsibility

Key takeaways from interviews

- **Risk of contamination.** *If the groceries are to be left unattended outside of peoples' homes, there is always a risk that the food will be contaminated.*
- **Protection against theft.** *An unattended delivery solution requires protection against theft.*

Key takeaways from theory

- **Protection against theft.** *An unattended delivery solution requires protection against theft.*
- **Risk of contamination.** *If the groceries are to be left unattended outside of peoples' homes, there is always a risk that the food will be contaminated.*

Other takeaways from literature

- **New technology needs to be further developed.** *The new technology and delivery solutions that is emerging still needs to be further developed before they can be implemented on the Swedish market.*
- **New technology not suitable for grocery deliveries.** *Many new delivery solutions are under development; however they might not be suitable for grocery deliveries but rather other types of products of less sensitive nature.*

Appendix H

Players in the Swedish E-grocery Market

The following appendix presents the 27 players that are currently operating in the Swedish market. The name of the store is followed by the website, see the Table below.

Table. The Swedish Stores that are currently operating e-grocery sales.

<i>Store</i>	<i>Website</i>
Linäs Matkasse	https://www.linasmatkasse.se
Mathem.se	https://www.mathem.se/
Mat.se	http://www.mat.se
Matsmart.se	http://www.matsmart.se/
ICA	http://www.ica.se
City Gross	https://www.citygross.se/mat/varor/
Willys	http://handla.willys.se/
Coop	https://www.coop.se/
Hemköp	http://handla.hemkop.se
Middagsfrid	https://www.middagsfrid.se/
Matkomfort	https://www.matkomfort.se
Årstiderna	http://www.arstiderna.com/
Bra mat hemma	http://www.bramathemma.se/
giboxen.se	http://www.giboxen.se/
gi-kassen	http://www.gikassen.se/vara-matkassar/
Food Monkey	http://www.foodmonkey.se/
Gastrofy	https://www.gastrofy.se/home
KlaraMaten.se	http://klaramaten.se/
Mat & Ro	http://matochro.se/
KlaraMaten.se	http://klaramaten.se/
Veckansmiddag.se	http://www2.veckansmiddag.se/
KlaraMaten.se	http://klaramaten.se/
Familyfood	http://familyfood.se/
Ecoviva	http://www.ecoviva.se/
Gröna kassen	https://www.gronakassen.se/
Tre bönder	http://www.trebonder.se/
Vår mat	http://www.varmat.com/

Appendix I

The Interviewee Ratings

This appendix presents a full review of the responses from the quantitative data gathering during the interviews. The Y axis correspond to the importance of the different factors for the delivery solution, the customers, and Nowaste. A high value on the Y axis hence means high importance according to that interviewee. The interviewee IDs are stated on the X axis. The results are displayed in the Figures below.

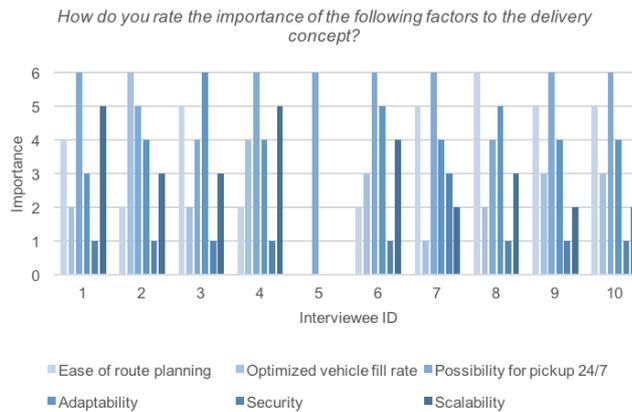


Figure. The interviewee responses to what factors that are of highest importance to the delivery concept.

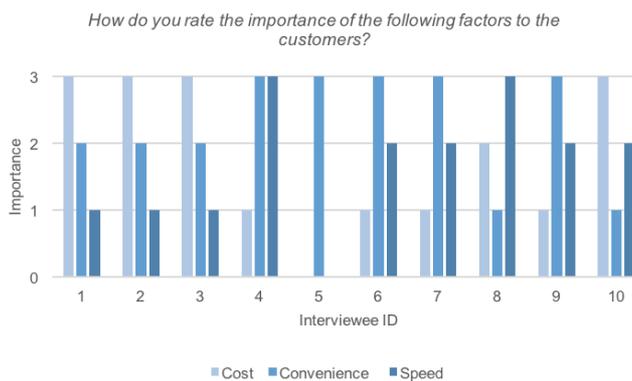


Figure. The interviewee responses to what factors that are of highest importance to the customers.

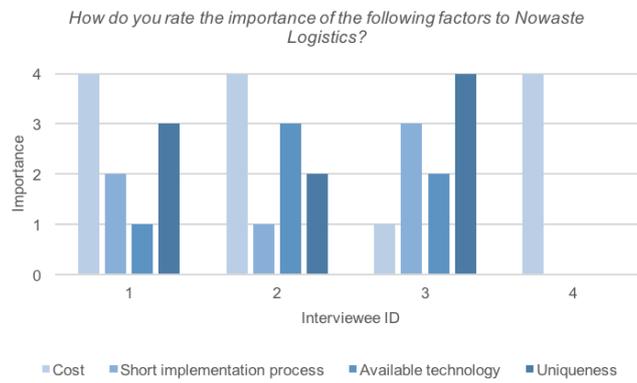


Figure. *The interviewee responses to what factors that are of highest importance for the implementation at Nowaste.*

Appendix J

The Observation at Nowaste

In order to gain a better understanding of Nowaste's day-to-day operations, an observation at their terminal in Helsingborg is performed. At the observed terminal, Nowaste handles transshipment of fruit and vegetables from Everfresh's suppliers to their customers, which include wholesalers and grocery stores all over Sweden. Nowaste are responsible for storage, order assembling and of contracting logistics providers for delivery to customers.

Terminal Activities

Incoming trucks from fruit and vegetable suppliers arrive at Nowaste's terminal unloading gates. Most of the goods arrive loaded on pallets, and the Nowaste personnel then unload the trucks using forklifts. The storage areas are divided into an automated part and a manual part. In the automated part the pallets are dropped off at a conveyor system that places the pallet on the right place in a shelving system. The manual store areas are organized in numbered aisles where every product have a given spot. The store areas include several rooms with different temperatures, and the products are stored in the temperature zone where they will cope the best. Most of the areas keep a refrigerated temperature but some rooms are warmer to accommodate products of a more temperature sensitive nature, for example bananas and basil. The order assembly process often involves both automated and manual picking. The automated picking are done by industrial robots, which assemble pallets with different products based on the customer order. The robot can only handle pallets where the products are packed in SRS-boxes, and therefore must some of the picking be done manually. When a pallet is finished, it is wrapped in plastic film and placed by a given outgoing loading gate. When an entire order picking is finished, it is loaded onto a truck that delivers the order to the customer. All deliveries are made with refrigerated trucks. The high extent of automatization within the terminal is what gives Nowaste their unique edge at the market.