Performance Measurement of E-commerce Collection and Delivery Points

Improvements through a holistic system approach

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Abstract

Collection and delivery points have become increasingly important due to the current e-commerce trend. In addition to the general rise within e-commerce the extraordinary situation with an ongoing SARS-CoV-2-pandemic has further increased the demand for sufficient parcel deliveries. The purpose of this master thesis has been to investigate how different stakeholders connected to e-commerce measure performance of collection and delivery points. Observations and interviews with distribution companies, omni-channel retailers and parcel agents have been conducted. This thesis also aims at investigating whether the current way of measuring performance can be improved and how that then would be possible. Collection and delivery points for e-commerce deliveries, including parcel lockers, parcel agents and in-store pickup, lies within the scope of this thesis. The current situation has been analyzed by mapping out the performance indicators currently used by the different stakeholders. Potential of improvement has then been identified. The result shows that stakeholders, as well as the society in general, could benefit from an applied system perspective. Suboptimization, both within and between different groups of stakeholders, could be avoided if a holistic system approach for performance measuring were to be implemented. Incitements for collaboration could also arise as a result of implementation. This thesis also addresses the greatest challenges related to the implementation of a system perspective. The challenges are mainly comprised by the lack of cost and benefit sharing as well as reluctance to share information and data. The prospect of the realization of this master thesis is to provide stakeholders connected to e-commerce deliveries with a new approach to performance measurement. By applying a holistic view, synergies could be created, and the efficient frontier be moved forward.

Keywords: performance measurement, performance indicators, collection and delivery points, parcel locker, parcel agent, in-store pickup, system perspective

Sammanfattning

I det nuvarande e-handelsklimatet har utlämningsställen för e-handelsleveranser blivit allt viktigare. Utöver den generella uppgången inom e-handel har den extraordinära situationen med en pågående SARS-CoV-2-pandemi ökat efterfrågan på tillfredsställande paketleveranser ytterligare. Denna masteruppsats syftar till att genom observationer och intervjuer med aktörer, kopplade till utlämning av e-handelsleveranser, undersöka hur de olika typerna av aktörer jobbar med att mäta prestation inom området. De aktörer som varit i fokus för masteruppsatsen är distributionsföretag, omnikanalsåterförsäljare samt paketombud. Uppsatsen syftar även till att undersöka om det nuvarande sättet att mäta prestation kan förbättras och hur det i så fall skulle kunna utvecklas. Utlämningsställen för e-handelsleveranser, i form av leveransskåp, ombud och hämta i butik, ligger innanför uppsatsens fokusområde. Genom att kartlägga vilka prestationsindikatorer de olika aktörerna använder sig av har nuvarande situation analyserats och förbättringspotential identifierats. Resultatet visar att aktörer, såväl som samhället i stort, skulle kunna gynnas genom att tillämpa ett systemperspektiv. Om ett holistiskt systemperspektiv implementeras för mätning av prestationer kommer suboptimering mellan och inom aktörsgrupperna att undvikas och incitament till samarbete mellan aktörer att öka. Uppsatsen behandlar även de största utmaningarna relaterade till att applicera ett systemperspektiv. Utmaningarna består främst i avsaknaden av ett gemensamt kostnads- och nyttoperspektiv och motvilligheten till att dela information och data. Förhoppningen med genomförandet av denna masteruppsats är att förse aktörer kopplade till e-handelsleveranser med ett nytt synsätt på prestationsmätning. Genom att höja blicken och applicera ett helhetsperspektiv kommer synergieffekter att kunna uppnås och effektivitetsfronten att flyttas framåt.

Nyckelord: prestationsmätning, prestationsindikatorer, utlämningsställe, paketombud, leveransskåp, hämta i butik, systemperspektiv

Acknowledgments

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1 Introduction

This introduction provides the reader with the background and motive of this master thesis. The research problem and purpose are briefly described, and three research questions are presented. Delimitations are made and they are described along with the scope of the thesis. An outline is then given to help the reader navigate through the thesis.

1.1 Background

A survey reveals that in April 2020 78% of the Swedish population shopped online, which is the highest percentage ever measured and 8 percentage points higher than the previous year (PostNord, 2020). This development is partly due to a general upward trend but also an effect of the ongoing SARS-CoV-2 pandemic, which has led to a situation where people to a higher extent turn to e-commerce as opposed to visiting physical stores. This situation puts higher demand on e-commerce retail and on omni-channel supply chains. E-commerce is described by Zheng (2009) as: "various online commercial activities focusing on commodity exchanges by electronic means, Internet in particular, by companies, factories, enterprises, industrial undertakings and consumers". Due to this digitalization trend in retailing, omni-channel retailing has emerged as a strategy for retailers to enable customer service in both physical stores and online. Omni-channel retailing is associated with both challenges and opportunities for the retailers as it gives the retailers more possibilities to sell and market to customers but also more channels in which performance is required. (Bell et.al., 2014)

The new omni-channel world might however cause challenges in supply chains and in how to measure performance of different channels. As effective logistics has become more relevant and important for companies the cities have developed accordingly. The infrastructure and city logistics available have become crucial to support the delivery options provided by retailers. In the new logistics landscape fast deliveries are made possible by

forwarders delivering orders rapidly by for example vans and bicycles (Altenried, 2019). However, as the delivery landscape is developed several downsides have surfaced, such as traffic congestion and air pollution in the cities due to an increased number of delivering vehicles. If no interventions are made the number of delivery vehicles in the top 100 cities in the world will increase with 36% by 2030. This will result in an increase of 32% in emissions from delivery vehicles and an increased congestion by 21%, adding an average of 11 minutes to the commute per day for the people living in these cities. (WEF, 2020)

Whilst the commerce is digitalized with effects on city logistics, great challenges have also emerged as a consequence of an ongoing urbanization trend. As off 2007 there are more people living in urban areas than in rural areas across the world. How to create sustainable economic development and a more sustainable use of resources are some issues related to the trend. Experts mean that cities will have to take and are taking great responsibility in reaching the future global sustainable development goals. (IVA, 2017) The United Nations (UN) development goals were compiled 2015 as a framework for the member states on how to work with the 17 goals to reach environmental, social and economic sustainability by 2030. Among the 17 UN development goals, goal number 9 and 11 are especially relevant to this thesis. Goal number 9 aims at finding the key to sustainable economic and environmental challenges through innovation and technological progress. The goal is called "Industry, Innovation and Infrastructure" and focuses on how to "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation". Goal number 11 is called "Sustainable Cities and Communities" and focuses on how to "Make cities and human settlements inclusive, safe, resilient and sustainable". This goal discusses how the rapid urbanization causes problems related to inadequate and overburdened infrastructure and services. (UN, n.d.)

An important piece of the puzzle to achieve sustainable e-commerce is to have high performing last mile deliveries. One way of conducting last mile deliveries is by mergers at micro-hubs which enable consolidation of parcels into smaller vehicles with lower volume and fuel consumption and thus reduced pollution. The consolidation at micro-hubs also contributes to restricting the use of long-haul trucks in residential areas. Moreover, retailers can offer customers to pick up their deliveries at a parcel locker or other collection and delivery point, which can be located in the nearest store (Jaller & Pahwa, 2020). Collection and delivery points can contribute to

reduced distance driven and reduced number of failed deliveries which will result in a lower operations cost for the e-retailer. (Gevaers et.al, 2014)

1.2 Research problem

In the systematic review of literature by Olsson et al. (2019) it is shown that performance measurement is present in last mile logistics research. Research articles available are sub-themed and have different focus areas, such as environmental performance, customer focused performance and economic performance. The research available lacks a holistic approach which needs to be addressed. As of today, there are also only limited research on performance measurement in relation to e-commerce collection and delivery points. A gap in the research can therefore be observed and constitutes an opportunity for an emerging practice.

Collection and delivery points could have a vital part in creating sustainable last mile logistics and therefore performance measurement connected to this field calls for attention. Performance measurement is an important part of assessing and developing operations and businesses. It is however easy for organizations to get stuck in their old ways and ultimately the things that gets done are the things that are measured. Hauser and Katz (1998) state that organizations become what they measure.

When looking at performance measurement and the ability to optimize the distribution network for e-commerce deliveries the absence of a cohesive system could constitute an issue. The article "Integrating collection-and-delivery points in the strategic design of urban last-mile e-commerce distribution networks" written by Janjevic et al. (2019) raises the importance of considering distribution through collection and delivery points as part of a network. In a report published by the World Economic Forum the importance of effective usage of data and collaboration between stakeholders to enable a more sustainable future for last mile deliveries is also emphasized (WEF, 2020).

1.3 Purpose

The purpose of this thesis is to explore current metrics for performance measurement and suggest ways through which measuring of collection and delivery points could be improved. Different types of stakeholders connected to e-commerce deliveries presumably have differed approaches when assessing collection and delivery points. By mapping out the different key performance indicators essential for different stakeholders it will be possible to identify potential for improvement. The intent is to apply a holistic perspective and identify existing challenges. To achieve the given purpose the following research questions were formulated:

RQ1: What performance indicators do various stakeholders use to assess different collection and delivery points?

RQ2: What challenges do the different stakeholders experience when measuring performance?

RQ3: How could performance measuring of collection and delivery points be improved by a holistic approach?

1.4 Scope and delimitations

Three of the main alternatives of e-commerce distribution to end customers in Sweden have been investigated in terms of how to measure performance. Due to variations between countries, this thesis has been written with focus on one market. As both authors are Swedish residents, born and raised in Sweden, the choice of market was self-evident. Parcel agents, parcel lockers and in-store pickup are the collection and delivery points which are covered in this thesis. Traditional shopping has been excluded as the focus of the thesis are challenges related to e-commerce deliveries. According to Gevaers et.al. (2014) clustering of goods is in most cases a more sustainable alternative to home deliveries, thus clustering options have been in focus and home deliveries were excluded from the scope of the thesis. Furthermore, the option of home delivery was excluded because of the complexity of treating every specific customer or delivery address as a unique collection and delivery point. Pickup at distribution center has also been excluded as it is not one of the delivery options most frequently offered to e-commerce costumers in Sweden. Moreover, the transports

carried out in the earlier stages of the distribution has been excluded as the focus of the thesis has been last-mile deliveries. Figure 1 is a conceptual model of the distribution network and the area within the dashed line describes the scope of this thesis. The arrows illustrate product transports executed throughout the distribution network. The distribution can however in fact be associated with several more transshipments at both national and regional levels for both retailers and distribution companies.
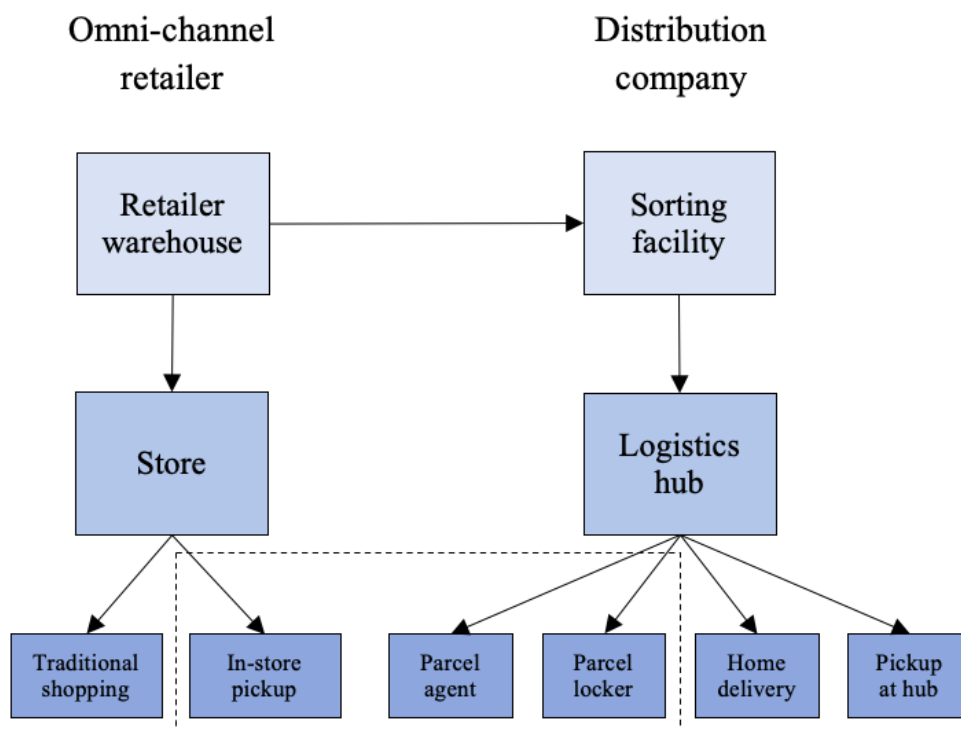
Figure 1: Conceptual model of the distribution network and the scope of the thesis (own figure)

As this master thesis was conducted under a limited time period, additional delimitations had to be made. Delivery lockers which exclusively handle groceries was not considered as the authors have focused on the wide perspective of omni-channel retailers which are not constrained by the challenges related to grocery deliveries. Furthermore, the conclusion was made that collection and delivery points across Sweden are similar to one and other. Hence, observations were conducted in Lund and Malmö, although the further scope of the master thesis will be on a national level. To get a sufficient representation of the collection and delivery option in-

store pickup, omni-channel retailers, opposed to pure e-commerce retailers, were selected for observations and interviews.

1.5 Outline of thesis

Introduction
This chapter will give insight into the research area and motivate the thesis. It further describes the research problem, purpose, delimitations and the scope of the thesis.

Theoretical background
This chapter provides the reader with the theoretical background regarding the subject of the thesis, especially the framework for working with performance measurement and an introduction to the different collection and delivery points.

Method
This chapter describes the methods used to gather and analyze information on the thesis subject. It also describes the companies which have provided the authors with insights into current performance measuring. Additionally, the quality and ethics of the thesis is described.

Empirical description and findings
This chapter presents the findings gathered during the realization of this thesis. The findings are compiled using a model presented in the theoretical background.

Results and discussion
This chapter presents the results of the thesis and discusses potential for improvements. Challenges for the implementation of proposed improvements are also covered.

Conclusion
This chapter concludes the key findings from the research and presents the contribution to the researched area. Moreover, it gives suggestions for future research in the field.

2 Theoretical background

The following chapter provides the reader with fundamental knowledge about performance measurement and different performance indicators. Three different collection and delivery points are also presented; parcel agents, parcel lockers and in-store pickup.

2.1 Performance measurement

Good operations performance is key to the success of any organization. Performance is however not a straightforward concept as a single performance measure is not enough to reflect an organizations state. (Slack & Brandon-Jones, 2019) To measure an organization's performance is vital when it comes to future development of a company and its different activities. By identifying crucial indicators, and evaluating the performance according to these, businesses can improve. These indicators are not just tools for passive observations but a way to modify organizational behavior and impact on decisions. If a manager or any other stakeholder within the company is compensated based on performance, they will strive to improve in this area. However, reaching the target could easily become the main goal and with this follows a risk of losing the overall view. (Franceschini et al., 2019) Three levels can be identified when it comes to performance: societal, strategic and operational. (Slack & Brandon-Jones, 2019)

Societal level - The societal level of performance is broad and focus on the sustainability of the operations. Sustainability with regard to people (social), planet (environment) and profit (economic), that represents the triple bottom line, provides the base of performance on this level. Stakeholders and how they get affected by the operations are considered. Social sustainability concerns impact on the quality of people's lives affected by the operations and cover areas such as customer safety from products and services as well as staff safety and workplace stress. Environmental impact on the other hand covers issues such as levels of transport-related energy, noise, fume and emission pollution as well as

environmental impact of process failures. The economic bottom line is the economic account of the operations measured by profitability and return on assets. Things such as cost of producing products and services as well as effectiveness of investment in operations resources are considered in the economic part of sustainability. (Slack & Brandon-Jones, 2019)

Strategic level - At the strategic level the focus of performance lies within the strategic impact of operations. Operations strategic impact includes areas such as risk, learning, capital, cost and revenue. Operations that lead to fewer failures or a reduced number of errors will lower the risk of operations failure. By building capabilities through process learning and improvement, future innovation is enabled. Higher utilization of operations capacity will lead to a reduced need of capital to provide capacity. Higher revenue, as a result of for example enhanced service for customers, will lead to higher profits. Lowered operating cost, due to high efficiency or less waste, are other things that would lead to higher profits. (ibid)

Operational level - Performance on an operational level requires a tightly defied set of objectives. On this level there are five main performance objectives that should be defined; quality, speed, dependability, flexibility and cost. These performance objectives have both internal and external effects. External effects could be on-specification products or services, short delivery lead time, dependable deliveries and faster responds respectively. High flexibility also provides a basis for new products or services with high frequency, a wide range of products/services and the ability to make volume and delivery adjustments. The external effects of the performance objective cost are low price, high margin or both. When looking at the internal effects cost is influenced by the other four performance objectives. The objectives lead to high total productivity affected by error-free and reliable processes, fast throughput and the ability to change. (ibid)

2.1.1 Performance indicators

The three levels of performance presented are not as straight forward as they may seem when it comes to defining the indicators of performance. Each level comprises many possible indicators and it can be hard to choose which indicators to use. Figure 2 gives multiple examples of performance measures at the different levels and their underlying categories. Performance indicators has to consist of something that can be quantified

and be specific enough to enable evaluation. Performance measures can be more or less detailed and there is good reason to use a variety. Some measures will help with the overall assessment on a higher level and guide the organization to see which part to improve in. At the same time more detailed indicators are also necessary to evaluate what needs to be done. Key when choosing indicators is to find a balance between having a few key measures and many detailed. A few measures could be straightforward and simple but lacking when it comes to representation of the full range of organizational objectives. On the other hand, having many measures are complex and difficult to manage but reflecting the organization in a more nuanced way. (Slack & Brandon-Jones, 2019)

	Social (People)		Economic (Profit)		Environmental (Planet)
Societal level	For example: - Employee satisfaction - Health and safety - Community programmes - Gender balance		For example: - Return on invested capital - Share price - Profitable growt		For example: - CO_2 emissions - Packaging waste - Water usage - Biodiversity

	Risk and resilience	Captial utilization	Service and revenue	Efficiency and cost	Capability for innovation
Strategic level	For example: - Service interruptions - Business continuity response	For example: - Return on assets - Capacity utilization	For example: - Profitability - Welfare per unit of expenditure		For example: - Revenue from new offerings - Pipeline of innovative offerings

	Quality	Speed	Dependability	Flexibility	Cost
Operational level	For example: - Defects per unit - Customer complaints - Scrap level - Warranty costs	For example: - Customer query time - Order lead time - Throughput time	For example: - Mean time between failures - Lateness complaints	For example: - Time to market - Product range - Customization	For example: - Transaction costs - Labour productivity - Machine efficiency - Variance against budget

Figure 2: Performance measures at the three levels (Adapted from Slack and Brandon-Jones, 2019, p.61)

Hauser and Katz (1998) address the issue of choosing the right performance indicators or more so the danger of choosing the wrong ones. When chosen indicators and goals are successfully met and awarded, indicators could

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lead to tremendous inertia. A manager who gets a raise or a promotion when performing well on the indicators tends to get committed to these indicators that has been part of her/his success. As long as the indicators are leading to long-term profits there are no worries but when the indicators turn out to be counterproductive the problems start. It seems to be hard for managers or other stakeholders to abandon the former indicators that they know how to maximize. Furthermore, the general difficulty to refocus an organization on new goals does everything but mitigate this risk. Hauser and Katz (1998) also state that organizations become what they measure. Choosing the right indicators when translating an organization's strategy into reality is crucial. The mission and strategy are tightly and inevitable connected to the indicators and there is a dependence on each other to become useful and meaningful. (Franco-Santos et al., 2012)

2.1.2 **The balanced scorecard approach**

The balanced scorecard approach is a well-known way of dealing with the complexity of performance measurement. This approach covers the strategic and operational level of performance and is an evolution from traditional performance measurement systems. In addition to financial measures of performance the balanced scorecard approach also includes more operational measures of customer satisfaction, internal processes, innovation and other improvement activities. The purpose and goal of the balanced scorecard is to reflect the organizations overall strategy in specific performance measures. A balanced range of measures provides a tool for managers to address a set of questions based in different perspectives; the financial perspective, the internal process perspective, the customer perspective as well as the learning and growth perspective. These questions and perspectives and their correlation are illustrated in Figure 3. (Slack & Brandon-Jones, 2019)
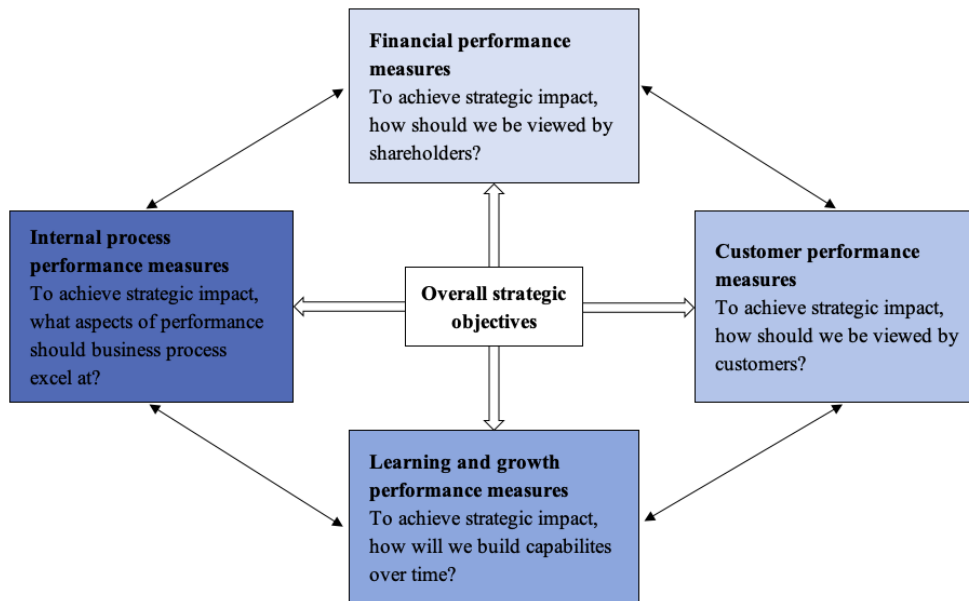
Figure 3: The measures used in the balanced scorecard (Adapted from Slack and Brandon-Jones, 2019, p.62)

The advantage of the balanced scorecard approach is the way in which the organizations performance is represented in one single report providing the means to take decisions in interest of the whole organization. By including measures that covers all parts and perspectives a suboptimization around narrow measures can be avoided. (ibid)

2.1.3 Trade-offs and the efficient frontier

When evaluating performance and finding the balance between different measures the efficient frontier has great significance. Improved performance often, especially when looking at the external effects, leads to trade-offs. Improved flexibility or variety most likely carry increased cost and so on. The efficient frontier consists of all the options of balance between two different measures which leads to the most efficient trade-off. When making a trade-off between measures the efficient frontier should be reached. However, if operational improvements exceeding the efficient frontier are made by the organization simultaneous improvements on both measures might be possible. The organization might be able to extend the efficient frontier and reach a new efficient frontier, see Figure 4. (ibid)
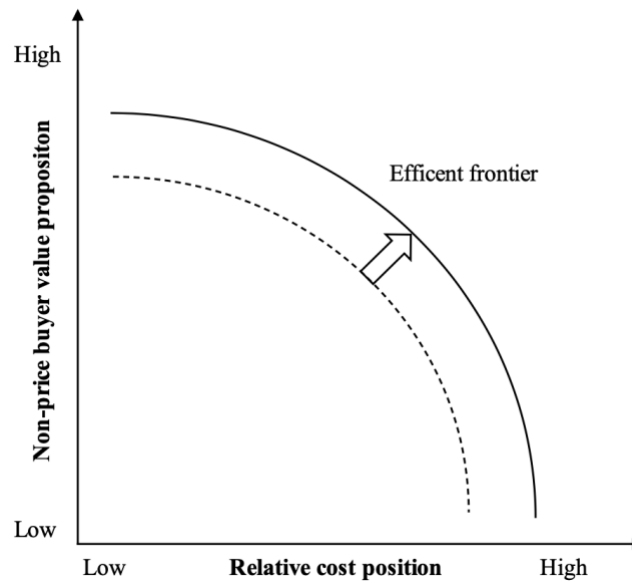
Figure 4: Illustration of the efficient frontier (Adapted from Sandberg & Abrahamsson, 2011, p74)

2.2 Collection and delivery points

Collection and delivery points are establishments through which customers could collect parcels sent to them. Parcel agents, parcel lockers and in-store pickup are three different types of collection and delivery points covered in this thesis. In Figure 5 different types of reception methods are visualized; the dashed line marks the scope of this thesis. A distinct attribute of collection and delivery points are whether they are attended or unattended and through which type of channel the customer makes the pickup.
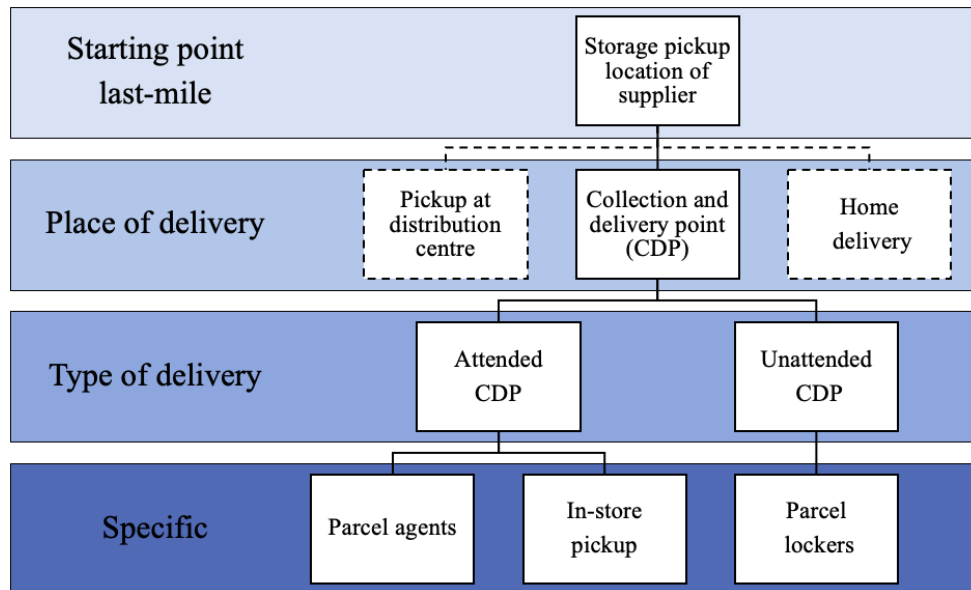
Figure 5: Types of reception methods in last mile logistics (Adapted from Gevaers et al., 2009)

2.2.1 **Parcel agents**

One of the most common and traditional ways of collecting and returning your parcel in Sweden is through a parcel agent. Parcel agents often emerge as a collaboration between a grocery store or smaller store and a distribution company. The store acts like an agent or representative for the distribution company and parcels are delivered by the distribution company to the parcel agent where store personnel then manage the final hand over to the customer. Parcel agents also manage returns (Larsson, 2019). In 2019 the three largest parcel distribution companies in Sweden collaborated with over 1500 parcel agents respectively. However, overlap occurs as multiple parcel agents represent more than one distributor. (Riese et al., 2019) Businesses who act as a parcel agent usually handle packages as a side activity but there are exceptions. Furthermore, customers can, at least to some extent, choose which postal agent they want to collect their package at. The receivers zip code is however the main instrument to decide where to deliver the parcels. Some parcel agents sell complementary products such as packing material and postage.

2.2.2 Parcel lockers

Parcel lockers are an alternative solution for customers to receive and send parcels and a way to manage deliveries or dispatches connected to online shopping. The lockers come in different sizes and the modules containing the lockers are placed in different locations with high footfall, such as grocery stores, train stations and shopping malls. (IPC, 2018) Figure 6 displays a graphic figure of the parcel locker concept, a digital monitor can be seen in the center through which the locker can be managed.

Figure 6: Parcel locker module – graphic figure (Parcel Monitor, 2019)

Parcel lockers are unattended collection and delivery points and the customer could be positioned as both the service receiver and service creator. Since a part of the customer value creation lies at the customers hands the customer could be perceived as a service employee in the parcel locker context. (Vakulenko et al., 2018) The concept of parcel lockers was first developed in 2001 by the Austrian locker maker KEBA in collaboration with Deutsche Post DHL. The parcel lockers have a complete coverage in Germany but are increasing in popularity also in other countries. (KEBA, n.d.) The two largest parcel locker providers on the Swedish market currently have about 900 locker modules, in total, located in Sweden (Instabox AB, n.d.a)(Allhorn, 2019).

2.2.3 **In-store pickup**

A number of e-commerce companies that also have a physical store offer their customers the choice to collect and/or return their parcels or merchandize in-store as an addition to more traditional options of delivery. In-store pickup is a vital part of omni-channel retailing and there are multiple reasons why companies choose to offer this service to their customers. (Tecsys, 2018) Figure 7 visualize the concept where the customer collects their ordered merchandize in the retailer's physical store.
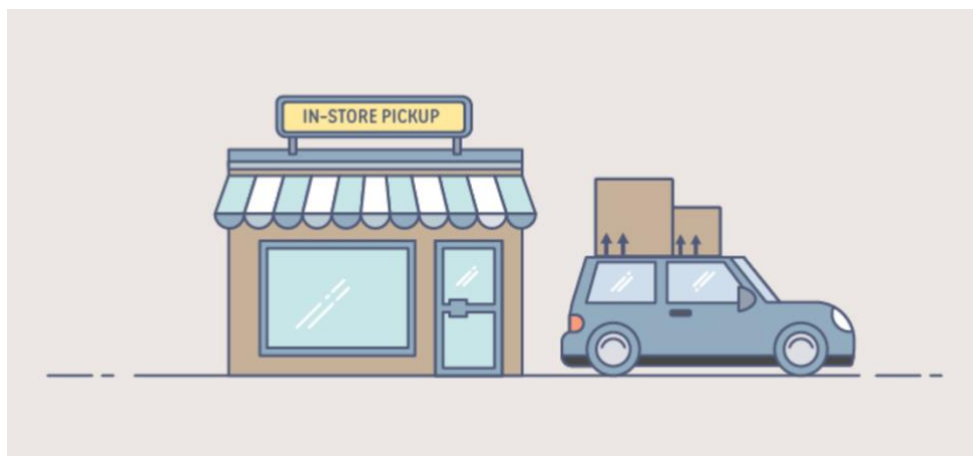
Figure 7: In-store pickup – graphic figure (Ness, 2016)

In-store pickup could affect performance in different types of ways according to Tecsys "11 Reasons for In-Store Pick Up" (2018). Increased foot-traffic leads to improved average order value and increased overall sales. Retailers make shopping easier for customers and gives the customer an increased flexibility. For the retailer itself in-store pickup leads to saved shipping costs and could also help with the turnover of in-store inventory, if this is used to fulfill in-store pickup orders. In-store pickup could also overall help to strengthen the brand image of the retailer and boost customer loyalty. (Tecsys, 2018)

3 Method

This chapter presents the approach, process and method used during the realization of this master thesis. In this chapter the main methods of data collection are described, and the respondents presented. This chapter also discusses how the findings were analyzed, along with the ethics and quality of the thesis.

3.1 Research approach and process

This thesis was conducted with an exploratory approach. When using an exploratory approach, the researchers analyze and reason on the occurrence of a phenomenon or how variables are connected. While conducting an exploratory research, researchers can analyze why an association, interdependence or relationship exists (Bairagi & Munot, 2019). Handfield and Melnyk (1998) discuss what theory building activities that can be used during operations management research and describe the steps of discovery, description and mapping as essential. These steps were used during the realization of this thesis and the exploratory approach helped the authors to perform comparative analyses to find interrelationships in the collected data.

The process followed during the realization of this thesis is illustrated in Figure 8. However, in reality the process was conducted in a more iterative manor. The identified research gap was the motive of the thesis and it enabled the authors to formulate the research problem, purpose and three research questions. To understand the context of the research field the theoretical background was compiled and constitutes a foundation of the thesis. How the data collection and analysis was carried out is described in chapter 3.5, where the compilation of the result also is discussed.
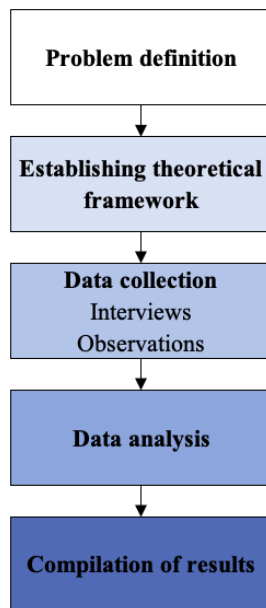
Figure 8: The process followed during the realization of this thesis (own figure)

3.2 Research design

This master thesis was conducted as an interview and observation study. An interview and observations study can be described as a qualitative method were the main data collection methods are interviews and observations. Qualitative research methods are characterized by non-numerical results while focusing both on how and why a phenomenon occurs (Taylor et.al, 2016).

Taylor et.al. (2016) describes that in qualitative research the researchers often start with an idea of how many settings and people they wish to analyze, but that the studied context is expanded as the picture is developed along the study. The authors of this thesis experienced the same development, the setting and the people studied was continuously expanded as the understanding of the studied context advanced. Furthermore, it is described how it can be difficult to obtain access to the desired setting (Taylor et.al. 2016). The authors managed to find several respondents willing to contribute to the thesis. However, some settings were more difficult to find respondents in than others, which resulted in fewer respondents in some stakeholder groups.

3.3 Data collection and representation

Collection of data can be done in several ways. However, while conducting data collection it is important to focus on the research goal and not collect more data than necessary as it will affect the timeline of the project (Walliman, 2006). Data collection can be done either as a primary or secondary data collection. Primary data is data that is collected by the authors, while secondary data is data that has been collected by other researchers (Kabir, 2016). In this thesis the two main data collection methods used were interviews and observations, which both are considered primary data collection methods.

3.3.1 Interviews

The main data collection method were interviews. Interviews were conducted to create an understanding of how different actors related to collection and delivery points measure and use performance data. The interviews established an understanding of what is measured and how, but also how the companies use the performance data to develop their services.

The four main methods of conducting an interview is described by Lantz (1993) as open, directed open, structured and semi-structured. The open interview is described as an interview where the respondent freely describes the phenomenon and the interviewer elaborates on the aspects the respondent considers meaningful. The directed open interview is similar to the open interview. However, with the directed open interview the respondents elaborate on the aspects considered meaningful by the interviewer. For both the open approaches broad questions are asked to invite the respondents to describe and answer according to their comprehension of the phenomenon. The structured interviews are however more formal, and the questions and context are decided in advance. The questions are designed to gather information on how the respondent address the subject and the context. For the totally structured approach the questions are asked in a specific order and the answers are given through a survey. The semi-structured approach however lets the interviewer follow the respondent's answers and ask questions according to the answers given (Lantz, 1993).

Both semi-structured and directed open interviews were conducted in the data collection phase of this thesis. The interviews with company representatives were conducted in a semi-structured way based on the questions in Appendix A. The context was decided on beforehand as the authors described the subject of the thesis when the contact with the respondents were established. As this thesis was conducted during the outbreak of the SARS-CoV-2 pandemic the semi-structured interviews were conducted via video-link or telephone. The semi-structured interviews were recorded to make sure that all data was correctly collected, and that no parameter was lost during the data analysis. Directed open interviews were conducted with personnel during the observations of the different collection and delivery points, as the opportunity was given. These shorter and directed open interviews gave an extra dimension to our findings.

The focus when interviewing distribution companies was to get an understanding of the services provided and the difficulties they experience throughout their distribution. The authors also wanted to see if any major differences in services provided, or how the different companies work, could be identified. The main focus was however the way in which the distribution companies measure their performance. The interviews were conducted in a semi-structured way based on the questions in Appendix A.1.

When interviewing omni-channel retailers, the focus was to understand their interaction with the logistics service provider and how their partnership is designed. The authors wanted to get an understanding of why omni-channel retailers chose to offer different delivery options and why, and mainly understand if and how the companies measure and evaluate the performance of their logistics services. The interviews were conducted in a semi-structured way based on the questions in Appendix A.2.

The interviews with parcel agents focused on understanding how the parcel agents measure the performance at their collection and delivery points. The authors wanted to understand what aspects the parcel agents consider important and how they use performance measurement to improve these aspects of their service. The interviews were conducted in a semi-structured way based on the questions in Appendix A.3.

To develop the project further other stakeholders were interviewed. The city of Helsingborg was interviewed to develop an understanding of how a

city works with optimizing the distribution network for their residents. Furthermore, the interest organization "Sveriges Paketombud" was interviewed as it is a member organization for parcel agents in Sweden and offers a holistic perspective from the parcel agents' point of view. The company LogTrade was approached and interviewed as it is an IT-service provider to many distribution companies and could offer insights into the industry. The interviews were conducted in a semi-structured way based on the questions in Appendix A.4 and A.5.

The interviewed distribution companies were chosen as they are the largest actors on the Swedish market for parcel deliveries. Retailers within various industries, who are well-known omni-channel companies with omni-channel strategies, were approached for interviews. For company descriptions, see section 3.4. For the full list of respondents, see Table 1.

Table 1: Interviewed companies and company representatives

	Company	Representatives	Title
Distribution companies	Bring	Stefan Edström	Nordic Quality & Customer Experience Specialist
	DB Schenker	Per Christoffersson	Network Manager Collection Points
		Tina Ränzlöw	Regional Manager
	DHL	Jonas Lindell	Managing Director eCommerce Solutions Sweden
	PostNord AB	Mathias Olsson	Head of Retail
Omni-channel retailers	IKEA	Sebastian Krysén	Development Leader
	LYKO	Tom Thörnblom	Head of Communication and Sustainability
	Stadium	Daniel Johansson	Logistics Director
Parcel agents	ICA	Per Carlén	Business Manager Convenience
	Leveriet	Mattias Celinder	Business Area Director Properties
Other stakeholders	City of Helsingborg	Linda Bermin	Traffic Planner
	LogTrade	Pontus Berg	Business Developer
	Sveriges entreprenörer	Olle Janrik	Associate Director

3.3.2 **Observations**

To create an understanding of different collection and delivery points and what services they provide, observations were conducted as a step of the data collection process. Observation is a form of primary data collection that should be conducted by observing an ongoing situation and collecting relevant aspects that are monitored (Bairagi & Munot, 2019). The observed locations can be found in Appendix B.

The observations focused on the perspective of the service provider and on identifying potential aspects which could be analyzed through performance measurement. Furthermore, different aspects relevant for users of the services was observed to create an understanding of the service provided. One of the important aspects while conducting an observation is to limit the variables observed, so that only variables relevant for the research is analyzed (Walliman, 2006). Observations can be conducted either as participant-observations or non-participant-observations. Participant observations are described as observations were the observer put him- or herself into the observed situation, whereas in non-participant-observations the observer does not take part in the situation but instead only monitor (Bairagi & Munot, 2019). In this thesis the authors conducted both types of observations. Participant observations were conducted as the researchers collected parcels from the unattended parcel lockers. While observing the rest of the collection and delivery points non-participant observations were conducted. During the observations complementary information was retrieved from personnel working at the locations.

3.4 Company introduction

A short description of the different stakeholders interviewed during this master thesis is presented below. Tables illustrate which of the collection and delivery points the different stakeholders offered at the time this master thesis was written.

3.4.1 **Distribution companies**

The largest distribution companies, on the Swedish market and relevant to this master thesis, are presented below. Interviews were conducted with

representatives from all the companies except for Instabox. The collection and delivery option provided by Instabox was however observed. Collection and delivery options offered by each of the presented companies are displayed in Table 2.

Table 2: Collection and delivery options offered by researched distribution companies

		Parcel agents	Parcel lockers
Distribution companies	Bring	x	
	DB Schenker	x	
	DHL	x	x
	Instabox		x
	PostNord	x	x

Bring is part of the Posten Norge group, which is the fourth biggest post and logistics actor in the Nordic. Bring is a Nordic carrier that handles parcels and other goods, can keep stock for their customers and have experience in transporting climate sensitive cargo. (Bring Logistik AB, n.d.)

DB Schenker in Sweden is a subsidiary of German, government owned Deutsche Bahn. DB Schenker offer shipments of goods and packages all around the world by plane, boat, truck and train. Besides transportation the company can provide logistics solutions such as storage and information services. (DB Schenker Sweden, n.d.)

DHL operating in Sweden is part of Deutsche Post DHL. DHL is one of the market leaders when it comes to logistics services and has a global network. Services offered by DHL is international transports by air, sea, road and rail, express deliveries, contract logistics and international letter services. (Deutsche Post DHL Group, 2020)

Instabox AB is a Swedish distribution company that started in 2015. Instabox differentiate themselves from previous actors by offering deliveries and returns from parcel lockers as their sole option. (Instabox AB, n.d.b)

PostNord AB is the largest company in the Nordic when it comes to communication and logistics solutions. The company was formed in 2009 when Posten AB and Post Danmark A/S merged. PostNord is owned by the

Danish government (39,3 percent) and the Swedish government (60,7 percent), votes are divided 50/50 between the owners. PostNord offers nationwide postal services in Sweden and Denmark. (Regeringskansliet, n.d.)

3.4.2 Omni-channel retailers

Representatives from the following omni-channel retailers with a strong e-commerce presence and omni-channel distribution were interviewed and/or observed. All companies were objects of observation, but no interview was conducted with Åhléns. Table 3 displays the delivery options currently offered and whether the retail company collaborates with and accommodates parcel lockers.

Table 3: Collection and delivery points connected to researched omni-channel companies

		Parcel agents	Parcel lockers	In-store pickup	Accomodate parcel lockers
Retail companies	IKEA	x	x	x	
	LYKO	x	x	x	x
	Stadium	x	x	x	
	Åhléns	x		x	x

The Swedish home furnish retailer *IKEA* is a global company often associated with its flat packaging concept. IKEA was founded in 1943 by Ingvar Kamprad. (IKEA, n.d.a.) Click-and-Collect is a delivery option provided by IKEA where the customer does not need to enter the physical store to shop (IKEA, n.d.b). IKEA also offer its customers the option of collecting their ordered IKEA products in parcel lockers located outside of their department stores (Gunnilstam, 2018).

Lyko is a Swedish omni-channel retailer of hair and beauty products who also offer salon services. Physical stores are located in Sweden and Norway exclusively, but the company also conduct e-commerce sales in Finland and Denmark. In 2003 the webpage lyko.se is started and in 2005 the webpage developed into a real e-commerce platform. In 2018 Lyko started a collaboration with Instabox and installed parcel lockers in multiple stores. (Lyko, 2020)

Stadium is a large Swedish retail chain selling sports clothing and equipment. The company has evolved from its first physical store in 1987 to be one of the largest sports retailers in northern Europe. In 2007 Stadium opened its first online store, stadium.se. A "order-in-store" concept was launched in 2017 allowing customers to order from the total assortment. (Stadium Sverige AB, n.d.)

Åhléns is a large Swedish chain of department stores founded in 1899. Åhléns offers its customers fashion, beauty, interior design and entertainment in physical stores as well as online. (Åhléns, 2020a)

3.4.3 **Parcel agents**

Customers can pick up, return and send their parcels at *EWAY*, located at Burlöv Center, a shopping mall in southern Sweden. EWAY offers changing rooms, workspaces and wrapping material. EWAY also works as an information center at the shopping mall. (Burlöv Center, 2020)

ICA is a large Swedish chain of grocery stores which usually are owned by franchisees. Many of the stores acts as agents for other companies and provides different services for their customers. (ICA, n.d.)

Leveriet is a Swedish parcel agent concept created on the initiative of real estate company Atrium Ljungberg. Leveriet currently operates on four locations in Sweden and offers its customers services such as access to changing rooms, wrapping material and workplaces with free Wi-Fi. (Leveriet, n.d.)

3.4.4 **Other stakeholders**

LogTrade Technology, founded in 1992, is a company working with logtech or digital logistics. LogTrade provide their customers with cloud-based software services within transport administration. (LogTrade Technology AB, 2019)

Sveriges Paketombud is a Swedish non-profit organization that represents and negotiates for parcel agents. The organization works towards safety and to create long-term advantages for members within the industry. Sveriges Paketombud also develops rules and agreements and strives towards

balance between the different parties on the growing market. (Sveriges Paketombud, n.d.)

The city of Helsingborg is located in the south of Sweden and is the eighth largest city in the country. Helsingborg had 147 734 residents in January 2020 and over 73 500 individuals have their workplace within the city. The city has an active industry and commerce and there are almost 14 700 companies registered in the city. (Helsingborgs stad, n.d.)

3.5 Data analysis

The data obtained through the described data collection methods was processed to reach a result of the thesis. Recordings from the semi-structured interviews were transcribed to ensure that all data gathered was addressed and examined. The data was analyzed relative the theoretical background, especially the model described in Figure 2. The model was used to compile the findings from the interviews with an analytical approach. The aim of the analysis was to conclude if any patterns could be identified using comparative reasoning. The results were then discussed, and both expected and unexpected results was examined. Moreover, the authors reviewed and concluded the findings with regard to the research questions.

3.6 Research quality

A number of limitations affected the quality of the findings and hence the result. Due to a limited timeframe the amount of data collected was limited. Furthermore, the data collection was limited due to the fact that many company representatives were on summer leave during the realization of this thesis, or otherwise had no opportunity to answer questions. It is also possible that many companies experienced difficulties related to the ongoing SARS-CoV-2-pandemic and hence could not prioritize to engage in this master thesis. If all approached companies would have had the possibility to participate the results of this thesis could have turned out different. The authors are however pleased with the extent in which different stakeholders chose to participate and are confident that enough information was gathered to discuss the current situation.

The number of identified performance indicators are possibly also affected by the number of respondents from each category of stakeholders. As this thesis initially focused primarily on the distribution companies, more interviews were conducted with representatives from these companies which potentially led to more findings in that category.

3.7 Ethics of research

As with any research, qualitative research requires that the authors apply ethical principles to secure the moral of the thesis. One aspect of importance when conducting a qualitative research is privacy of the respondents (Orb et.al, 2001). Thus, it was important for the authors to protect the integrity of the participants while focusing on the contribution to the research field. To address this, and as the thesis covers a highly competitive business field the authors chose to not link the stakeholders specifically related to the findings. This results in a holistic view of the companies, were the findings are presented overall, connected the different groups of stakeholders. The privacy of the respondents was addressed as they were asked before the interview started if the interview could be recorded. All respondents gave their consent to be recorded and no interviews were recorded without the permission of the respondent.

Furthermore, the competitive situation of the industry could have affected the result of the study. It could for example have affected to which extent the respondents answered the questions asked with full transparency. Additionally, the authors were several times during the interviews told that parts of the information disclosed were company secrets and should not be used as material for the thesis. This was of course fully respected by the authors and the information that was described as classified has not been used during the execution of the thesis.

Kvale (1992) discusses objectivity related to qualitative research and the importance of researchers addressing this difficulty. To remain objective as a researcher is a requisite to be able to contribute to the research field. Hence the authors have worked extensively to portrait the gathered information without any bias and as objectively as possible.

4 Empirical description and findings

Findings from the observations and the interviews are presented in the following chapter. To create an understanding a compiled description of the observed collection and delivery points are given in the first section. The first section contains the findings from our observations. Findings from the interviews are then disclosed under each respective category of stakeholder. This chapter answers to the first two research questions:

RQ1: *What performance indicators do various stakeholders use to assess different collection and delivery points?*

RQ2: *What challenges do the different stakeholders experience when measuring performance?*

4.1 Collection and delivery points

When a Swedish resident makes an online order multiple options of how to receive the parcel are given. Options such as home delivery, collecting your parcel through a parcel agent as well as parcel lockers are common. Some companies also offer in-store pickup. As previously described in detail in the methodology chapter, observations and directed open interviews were conducted at different parcel collection and delivery points. The following is a compilation of the findings.

4.1.1 **Parcel agents**

The most common way of collecting your e-commerce parcel in Sweden is through a parcel agent. Parcel agents usually occur as an addition to the main business in smaller convenience stores, or as a part of a service point connected to a bigger grocery store. Collection and delivery points connected to grocery stores are often located in the area right outside of the store itself, but inside of the main entrance. The parcel agent is an attended

collection and delivery point and one of the observed parcel agents can be seen in Figure 9.

Figure 9: Parcel agent – ICA Förbutik (own photo)

Distribution companies collaborate with specific parcel agents and deliver carts of parcels on different intervals. Parcels are received by store personnel who usually have a set time span to digitally register the received parcels and sort them into storage shelfs. When the parcels are registered at the parcel agent a message is send out to the customer who made the purchase, declaring that the parcel can be picked up. To collect a parcel at a parcel agent the receiving customer needs to present a code that has been sent to her/him beforehand. The receiver also needs to identify herself/himself by either a physical ID card of some sort of digital identification. Typically, another person than the receiver can collect the parcel if she/he presents both hers/his own and the receiver's identification documents. Parcels are kept in a storage area in close proximity to the counter. Store personnel manages the parcels from the point that distribution companies deliver them at the store until the receiving customer retrieves them. The parcel agent also manages returns.

Collection and delivery points connected to larger grocery stores usually offer other services than postal, e.g. café and gambling, with the same personnel managing the different services. However, separate queuing systems were observed for the separate services and at the time of the observations queues were present in some cases. Some parcel agents also sell wrapping and postage. Customers have 14 days to collect letters and parcels if otherwise is not agreed upon with the distribution company. The capacity of handling parcels is large, and the stores have extra storage possibilities. The number of parcels managed fluctuate on a daily basis and in time for holidays like Christmas and Black Friday the quantity of deliveries increase.

In contrast to traditional parcel agents a relatively new type of collection and delivery point could also be observed. Leveriet collaborates with multiple distribution companies and acts like a pickup and return hub. A similar concept observed was EWAY. At these collection and delivery points, located in shopping malls, the customer could receive their parcel, try on ordered clothes at sight and handle returns right away. These collection and delivery points offer changing rooms as well as smaller lounge areas where customers could sit down and work with access to free Wi-Fi, see Leveriet in Figure 10. Observed collection and delivery points also offered free packing material, as well as more exclusive options for sale.

Figure 10: Collection and delivery point – Leveriet (own photo)

Personnel at one of this new type of collection and delivery point shared their experience of customers waiting for all their parcels (from different distributors) to arrive before making a visit to collect them all at the same time. One of these collection and delivery points collaborated with five different distribution companies at the moment. The personnel could however also see a trend of customers picking up their parcels sonner during the ongoing SARS-CoV-2 pandemic, figuring the reason to be that customers have more time on their hands.

4.1.2 Parcel lockers

Through observations some key findings have been brought to light and certain properties can be connected to the parcel locker solution. Parcel lockers are an unattended collection and delivery point where the receiver collects and returns their package independently. The parcel lockers observed were placed inside retail stores, in the indoor area right outside of a grocery store or in shopping malls. The locker modules varied in size and capacity at the different locations observed. Figure 11 displays a parcel locker module provided by Instabox as well as one module from DHL Swipbox.
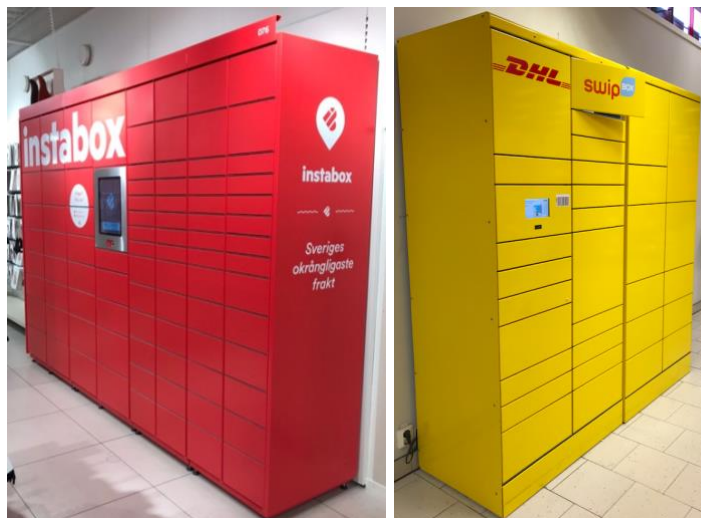

Figure 11: Parcel locker – Instabox and DHL Swipbox (own photos)

When the authors collected parcels from both Instabox and DHL Swipbox an eight-digit code provided by the delivery company through a text message to the receiver was inserted into the digital panel of the locker to

get access. One of the solutions did also require a signature from the collector. At the time of our observations there were no queues for access to the parcel lockers in any of the different locations. Opening hours of the store or shopping mall holding the parcel lockers limits the accessibility of the lockers. The lockers located in the higher end of the parcel modules were also observed to be far from easily accessible for shorter or disabled persons.

Personnel working at a retail store accommodating parcel lockers informed us that customers are sometimes lining up to collect their parcels in time for the store to open and at the time for the deliveries to arrive. Information were also given to us that the parcel lockers sometimes are full, resulting in that parcels can´t be delivered, leading to an extended delivery time for the customer. If the parcel locker module is full customers cannot manage their returns either. Parcels delivered through Instabox parcel lockers are allowed three days in the locker, during which time period the customer should collect its package. Uncollected packages are removed from the locker. The in-store personnel have no involvement in managing the parcel locker deliveries. Parcels delivered by DHL are allowed 14 days in the locker.

4.1.3 **In-store pickup**

In-store pickup is a service often provided by omni-channel companies and it allows customers to receive or return e-commerce parcels via the retailer's physical store. The customer gets a message when the ordered products have arrived at the store and they can collect them. One store that offers in-store pickup is the Swedish department store Åhléns. Picking up a parcel the customer is referred to the regular checkout, queues occurred at the time of observation. Åhléns customers normally have 14 days to collect their parcels but are offered an extended pickup time of 30 days in total right now. The current and exceptional situation in society caused by the ongoing SARS-CoV-2 pandemic is the reason for the extended pickup time (Åhléns, 2020b). The sportswear retailer Stadium also offers their customers in-store pickup. At the store the customers are referred to the back of the store, to the shoe department, to collect their parcels. IKEA also offers its customers the possibility to "click and collect". At the time of our observations the customers were however referred to outdoor pickup. See Figure 12 for the regular indoor pickup point at IKEA, located in an area outside of the cash registers.

Figure 12: In-store pickup – IKEA "Click and collect" (own photo)

4.1.4 **Summary of observations**

There are some distinctive differences between the different collection and delivery points which are important to consider. Whether they are attended or unattended are probably the most significant variation. Differences also consist of access flexibility and the possibility to offer other services. Parcel lockers could more easily than the other options be located in train stations, parking lots or other areas with 24-hour access. The presence of queues is also something that seems to differ between the different types of collection and delivery points.

4.2 Performance measurement from distribution companies' point of view

Performance measurement in this section relates to parcel agents and parcel lockers. However, the only interviewed distribution company using parcel lockers, use these as a complement to their parcel agents. Performance is therefore, in this case, measured on the same indicators as their parcel agents. The identified performance measurements are summarized in Figure 13 and discussed in detail in the following section.

	Social (People)		Economic (Profit)		Environmental (Planet)
Societal level	- Accessibility - Employee satisfaction - Health and safety - Diversity		- Return on invested capital		- CO_2 emissions - Share emission free vehicles

	Risk and resilience	Captial utilization	Service and revenue	Efficiency and cost	Capability for innovation
Strategic level		- Capacity utilization - Fille rate - Availability	- Cost per shipment - Revenue per shipment - Profitability		

	Quality	Speed	Dependability	Flexibility	Cost
Operational level	- Complaints - Technical support to postal service agents - Problems - Damaged goods	- Laytime at the collection and delivery point - Lead time - Process time	- Routine fulfilment - Registration of arriving goods - Returns - Shipping time accuracy - ETA	- Relocated parcels	- Shipping volume per customer - Weight per parcel

Figure 13: KPIs measured by distribution companies

4.2.1 KPIs on a societal level

Social - As the distribution companies have a commitment to be able to provide service to all customers, they assess *accessibility*. Accessibility in this case meaning whether or not the store in which they want to establish a parcel agent is adapted for disabled customers. This can be a determining factor when the distribution companies chose which stores to establish a new parcel agent in.

The distribution companies value good working conditions. Hence, the distribution companies measure the *employee satisfaction* of their own employees regularly. Furthermore, one distribution company mentioned that they used to measure an index for how satisfied their partners, the employees at the parcel agent, were with working with them. However, as the employees experienced that the survey was to extensive and time-

consuming, and the response rate declined, the distribution companies ceased with the surveys. The distribution companies also measure the *health and safety* of their employees. They suggest that this is important as it reflects the company profile and how well its employees are taken care of. However, the health and safety of the parcel agents' personnel, which execute their services is not measured. It is also important for the distribution companies that they offer a workplace that reflects the people of the society; hence they measure the company's *diversity* in terms of background and gender.

Economic - The distribution companies measure *return on investment, ROI*, on their big investments to follow up investment calculations.

Environmental - Distribution companies measure their CO_2-*emissions* and environmental impact as they experience an extensive pressure from the society and consumers to become more environmentally sustainable. They also experience that both customers and retailers wish to see their specific carbon footprint from the transportations provided by the distribution companies. Hence, they are working on ways to provide this detailed information about their transports.

In line with the environmental profile the distribution companies wish to establish, the distribution companies invest in new innovative vehicle alternatives which does not result in any CO_2-emissions. Furthermore, the companies measure how big *share of their vehicles that are emission free*, and how big share of their transports that are conducted by the emission free vehicles. The companies are also working on new ways to limit their transportation through high-energy transportation such as airfreight. Moreover, the companies are working extensively with optimizing their *fill rate* of vehicles and the delivery routes to further decrease their emissions.

4.2.2 KPIs on a strategic level

Capital utilization - As the distribution companies at times are struggling with having enough capacity it is very important to monitor the *capacity utilization* to be able to be one step ahead. The distribution companies monitor the capacity utilization at several levels, such as: vehicle utilization, sorting facility utilization and the utilization at the parcel agent locations. The distribution companies experience a lot of variance in the demand and hence they need to keep track of the utilization to be able to

provide service when they experience a peak. Furthermore, the capacity utilization is closely linked to the previously mentioned *fill rate*.

Regarding parcel lockers the distribution company can see in real-time which slots in the lockers that are *available*, hence they do not need to bring more parcels than necessary when replenishing the parcel locker.

Service and revenue/efficiency and cost - To be able to determine if the business is successful the distribution companies measure the *cost and revenue per shipment* to get the *profitability* per shipment. Besides measuring their own profitability, the distribution companies provide profitability data to the parcel agents so that they easily can see how profitable it is to be a parcel agent to that specific distribution company. The profitability report also includes growth rates to motivate the parcel agents for the future.

4.2.3 KPIs on an operational level

Quality - The distribution companies state that they measure customer satisfaction through *complaints*. However, how the measuring is carried out varies between companies. Some offer each customer to grade and comment the experience after an interaction with the distribution company. Others measure the interaction with the customer service department to determine the extent of customer complaints connected to a specific parcel agent.

Besides offering customer service to the consumers, the distribution companies offer the parcel agents *technical support*. This technical support is logged to see both which problems occur most often but also to see which parcel agents that need the most support. Furthermore, the complaints received from the parcel agents are documented to analyze what improvements can be done in the collaboration between distribution company and the parcel agent in the future.

To be able to develop the distribution service and the cooperation between distribution company and retailer the distribution company measure the number of deliveries that are affected by a *problem* committed by either part. They measure the occurrence and what caused the problem, so that they can improve the integration between the companies and eliminate the

problems. The distribution companies use different error codes to categorize the different problems that could occur in the supply chain.

The frequency of occurring *damaged goods* is measured and analyzed. Analyses are made to see if damaged goods are more frequent for a specific retailer or a specific parcel agent. The analysis is then evaluated to see if the retailer will need to use more packaging material to avoid damaged goods or if another possible solution can be found. It is important for the distribution companies to be on top of the damaged goods as this affects their reputation to the consumers and their promise to the effected retailer. It is also important for the retailers to solve these problems urgently as it effects their reputation as well.

Speed - The time that parcels spend at the shelf at the parcel agents is measured extensively. This *lay time at the collection and delivery point* defines the need of shelf space at the parcel agent. The average time is evaluated per time unit, while specific parcels that overrun the maximum lay time is counted separately.

Most companies reported that the data related to *lead-time* is collected automatically through the different "scanning check-points" throughout the supply chain. The check points are clocked each time the bar code on a parcel is scanned, resulting in a lot of data per parcel. The companies measuring a lot of data discussed how the digitalization trend and the increasing number of parcels have led to extreme amounts of data. In order to make extensive data analyses the companies discussed how they are working with artificial intelligence (AI) to increase their capabilities related to handling the data. The distribution companies state that lead-time is a very important KPI for them. This is mainly because they are working to become as efficient as possible and to provide the fastest service without losing quality. It is also important as it relates to their promise both to end customers and to the retail companies regarding expected delivery time.

Furthermore, some of the companies reported that they do manual controls of checkpoints that are not automatically recorded to get an understanding of the lead-time at a specific checkpoint. One example of a manual control was that they measured the time for the customer interaction at the parcel agent as this is one of the checkpoints where the companies wants to provide the fastest service.

The *process time*, for parcel pickup at the collection and delivery point, is measured during the customer interaction. Some measure the duration of the process through the phone applications used during the interaction. Occasionally the distribution companies measure the time for the interaction through observations. The process time is very important for the distribution companies as it is an important cost driver. The shorter process time the more parcels can be handled during the day. Hence shorter process times result in lower costs for the distribution companies. It is also important as a short process time is appreciated by the consumers.

Dependability - The companies state that they measure that the parcel agent is *fulfilling the routine* demands set by the distribution companies. This is especially related to; returning parcels that has not been collected by customers and performing ID-checks for every delivered parcel. They do however not explain how these measurements are carried out. One specific routine that was extra important for the distribution companies was the *registration of arriving goods* at the parcel agent. This is important for the distribution companies as the signal which indicates to the customers that their parcel has arrived at the parcel agent is sent out when the parcel is registered. If the goods are not registered there is a risk that the customers will not be able to pick up the goods as fast as possible which, in extension, will increase the amount of space needed for parcels at the parcel agent. The distribution companies measure the time the parcel agents use for registration of arrived goods and some set limits for how long this process should take.

The distribution companies make sure that the parcel agents offer service related to *returns* of parcels. They separate the parcels that is returned due to breached lay time, when the parcel has been on shelf for longer than the maximum lay time and returns that are made by customers due to unwanted products. It is important as the retailers wants to have the goods back as fast as possible to be able to sell the products to another customer. Hence the distribution companies follow how well the parcel agents handle the returns and that it is managed as fast as possible.

The distribution companies follow *shipping time accuracy*, how well the retailers have packed their parcels and are ready for shipment on the agreed shipping time. It is important for the distribution company to measure this as it effects their customer value proposition, and hence it is important that the retailers do their part of the shipment on time.

One aspect that the distribution companies wish to measure and provide information regarding is an *Estimated Time of Arrival, ETA*. This information could, when integrated with the warehouse activities at the retailer enable the retailers to provide an exact time of delivery to their customers. Measuring how well the ETA reflects the reality in each checkpoint will require big data analyses through AI and is something the distribution companies strive to accomplish in the future. The distribution companies have not started working with specific ETA for parcels delivered to parcel agents but are measuring ETA in their systems to know when they have sufficient data to be able to keep the customer value proposition of an ETA.

Flexibility - The distribution companies measure how often it occurs that *parcels are relocated*. Whether or not the customer has asked for a specific collection and delivery point when checking out in the e-shop or not, every parcel has an assigned destination when being handled by the distribution company. However, sometimes the destination collection and delivery point does not have room for the assigned parcel upon delivery and hence the parcel needs to be relocated to another parcel agent. Furthermore, they specifically measure and deal with the cases where the customer has chosen a specific location by themselves, and these parcels are often more prioritized not to be re-located.

Cost - When the distribution companies make a deal with a new retailer, they base the price on how many parcels the retailers expect to deliver through the distribution company and the expected average *weight per parcel*. The retailers are also asked to subdivide the expected *shipping volume* in different periods to enable planning on the distribution company's part. To see if the retailers follow their volume and weight prognosis the distribution companies monitor how many parcels are shipped during different periods during the year.

4.3 Performance measurement from omni-channel retailers' point of view

Retailers which offer their customers the option of online ordering are highly dependent on the services and performance of distribution

companies as well as collection and delivery points. All three options of collection and delivery points covered in this thesis are relevant to the business of omni-channel retailers. Performance indicators connected to their e-commerce deliveries has been identified during interviews and are displayed in Figure 14.

	Social (People)	Economic (Profit)			Environmental (Planet)
Societal level					- CO_2 emissions - Cardboard usage
	Risk and resilience	**Captial utilization**	**Service and revenue**	**Efficiency and cost**	**Capability for innovation**
Strategic level		- Fill rate	- Profitability - Collected parcels - Foot traffic/conversion/ avarage purchase		
	Quality	**Speed**	**Dependability**	**Flexibility**	**Cost**
Operational level	- Customer satisfaction /Quality - Customer value proposition - Deliveries on time - Service	- Lead-time	- Delivery accuracy	- Availability	- Returns

Figure 14: KPIs measured by omni-channel retailers

Many of the indicators measured by omni-channel retailers overlap indicators mentioned by the distribution companies, but some additional can be seen. Increased foot traffic connected to pickups, that could potentially lead to higher in store sales, are one of them.

4.3.1 KPIs on a societal level

Environmental – Omni-channel retailers wish to track their carbon footprint more explicit through the delivery services they acquire. However, the omni-channel retailers experience that the distribution companies use

incomplete allocation formulas to divide their CO_2-emissions. By retrieving more specific data allocated to their specific improvements the retailers would get a clearer view of the success rate of their alterations. To decrease their environmental impact one retailer works towards greater usage of electrical trucks. Another does not want to ship their goods via air freight anymore, neither connected to import nor e-commerce deliveries, as this mode of transport makes it impossible to reach their sustainability goals. Increased fill rates also lead to lowered levels of CO_2-emissions per parcel.

The retailers also measure how much cardboard is being used at their packaging facilities. It enables them to see how they can decrease the amount of *cardboard used* in their e-commerce shipments. Using less cardboard is good both in a material viewpoint but also as it enables less air to be transported in the distribution network. Improvements of these measures will in extension lead to less CO_2-emissions. Furthermore, the cardboard drives cost within the company both at purchase but also as the retailers pay a fee for the cardboard connected to recycling. The retailer has producer responsibility and are responsible for the end of the value chain for the cardboard.

4.3.2 KPIs on a strategic level

Capital utilization - *Fill rate* in transit is another important indicator measured by the retailers. Retailers find that distributors should collaborate to increase fill rate. A high fill rate increase capital utilization overall.

Service and revenue/efficiency and cost - *Profitability* is the most important factor for at least one of the companies. Profitability guides the company in decisions regarding which delivery options to offer their customers.

Collected parcels or percentage of parcels picked up on time as well as through which type of collection and delivery point they are delivered are measured. These indicators are of importance as they affect details connected to payments. The collection rate is of interest as it affects *cost*.

Foot traffic, conversion and average purchase tells the retailers how many customers that are entering the store, how many of them that buy something and how much they spend respectively. These measurements help the

retailers se fluctuations and how collaborations with parcel locker providers and different delivery options, such as in-store pickup, affect the business.

4.3.3 KPIs on an operational level

Quality - *Customer satisfaction* is often measured through a short questionnaire in the customers phone after a completed delivery. In addition, a customer experience platform which measure when keywords like the company name and a distribution company is mentioned together, on social media or on the internet, and if it is in a positive or negative context, are used. Customer satisfaction is hard to measure because data collected often is specific and quantitative. The retailers wish for a better way of measuring customer satisfaction.

Promises about time of delivery needs to be met to ensure a high level of fulfilled *customer value proposition*. This measure can be broken down into what is picked on time in the warehouse as well as what the carrier *delivers on time*.

Service performed by distribution companies are compared when delivery options are considered by the omni-channel retailer. Assistance with making an online order when in the physical store is also measured as this service prevents customers from turning to competitors.

Speed - Retailers measure *lead-time* during their own warehouse activities leading up to the transport conducted by various distribution companies. Furthermore, the retailers obtain data from the distribution companies which indicates the lead-time until the customer retrieves information that they can pick up their parcel. At least one company would however like to improve on how they measure and analyze lead-time. They wish to be able to track it on a day to day basis instead of on a monthly basis. By taking actions to minimize the number of loadings lead-time can be decreased.

Dependability - *Delivery accuracy*, how often a parcel is delivered on time per distribution company and country, is important as it reflects the customer value proposition and how well it is kept. Delays/mistakes from the distribution company can lead to a decrease in delivery accuracy. Omni-channel retailers who operate in more than one country can distinguish different delivery options in different countries and compare them against each other to find potential problems and their underlying cause.

Flexibility - *Availability* is one measure that is of importance when optimizing the delivery services offered. Omni-channel retailers have to consider which collection and delivery points to offer their customers. A high number of delivery options provide high flexibility.

Cost - Rate of *returns* are measured as well as more detailed information about where the returns are sent. Returns always creates a need of additional labor and thereby cost. Where the returns are sent also affect the total cost of operations. If products that are specific to the web shop are returned to the physical store it creates a need for distribution from store to distribution center.

4.4 Performance measurement from parcel agents' point of view

Distribution companies provide the individual parcel agents with reports containing information about number of parcels delivered, their customer satisfaction index as well as information about their monetary compensation. Distribution companies can also give data about overall trends regarding pickups and returns, connected to time of delivery/return, which provides the opportunity to look at differences from different areas on an aggregated level. Figure 15 displays performance measurements connected to the parcel agents.

	Social (People)		Economic (Profit)		Environmental (Planet)
Societal level	- Employee safety and work environment				

	Risk and resilience	Captial utilization	Service and revenue	Efficiency and cost	Capability for innovation
Strategic level		- Utilization	↘ - Profitability - Capitilization	↙	

	Quality	Speed	Dependability	Flexibility	Cost
Operational level	- Customer experience				- Parcel flow

Figure 15: KPIs measured by parcel agents

Interviews were conducted with representatives on a national level and displayed measurements might not fully cover what managers measure locally.

4.4.1 KPIs on a social level

Social - *Employee safety and work environment* are important issues for individual storekeepers that acts as parcel agents. Employee safety got extra attention a couple of years ago when there were a lot of problems with smash and grab, threatening situations, break-ins and fraud. Work environment has always been very important and something the individual stores work hard with.

4.4.2 KPIs on a strategic level

Capital utilization - Parcel agents who provide fitting rooms for their customers sometimes measure how many that uses them. The personnel keep track during a set period of time to assess the rate of *utilization*. Another matter that is measured is how much free wrapping paper that is used. Observed levels are then divided on allocation formulas like number of delivered packages, for instance.

Service and revenue/efficiency and cost - Being a parcel agent is a low margin business and therefore the *profitability* and ability of *capitalization* is of great importance. The parcel agent business could be seen as a service provided to customers and it is not self-evident that it is profitable to offer this type of service. However, the apprehension of what would happen if the store cuts this service is imminent, the risk of losing business might be too big.

To find a way to capitalize on customers, who visit the store to collect their parcels, are of greatest importance. It is not just increased foot traffic that is of importance, since it does not tell the full story. Parcel agents want customers who usually make their purchases at competitors to choose their alternative when they are already at their location. Measures are not made of foot traffic but instead interviews are conducted with the storekeepers to get a feel for their overall impression of things related to their parcel agency. It is currently not possible to see correlations between parcel deliveries and other purchases since these services are recorded in different systems.

4.4.3 KPIs on an operational level

Quality - Focus lies on the development of the *customer experience*. Even though few things are actually measured parcel agents strive to make the visit more effective and thereby enhance the customer experience. Solutions are needed to improve the distribution flow and contribute to lowered personnel costs. Parcel agents whose main focus not is to be profitable also measure customer experience and ask their potential customers what they wish for when it comes to customer service.

Cost - Parcel agents measure the *parcel flow* and look at parcels delivered, sent and returned. The flow of parcels is an important cost and revenue driver, therefore crucial to keep track of.

4.5 Performance measurement from the point of view of other stakeholders

Discussion regarding performance measurement with other stakeholders did not result in any specific indicators measured. Rather the discussions regarded what actions could be performed in the industry to create better performance in the future. For example, several stakeholders report that deliveries could be managed with less pollution and less heavy vehicles in city areas if the distribution companies started using logistics hubs in cities. The suggested logistic hubs would be used by all distribution companies and would hence enable consumers to coordinate their pickups better. Some stakeholders also discuss the possibility to coordinate home deliveries from the logistic hubs to ensure that home delivery vehicles are fully utilized, and that one address is not visited by several home delivery vehicles unnecessarily.

To find further cooperation between the distribution companies the stakeholder organization "Sveriges Paketombud" works towards finding a national platform for the parcel agents. The national platform would enable coordinated transports in rural areas and aims at enabling fewer transports and better service at a lower cost in these areas. The foundation of the platform would be for the companies to share information regarding their shipments so that the platform could be used to coordinate the consolidated deliveries.

4.6 Summary of findings

Every group of stakeholders measure performance at each of the three levels; societal, strategic and operational. Differences however occur in what indicators they use when they measure. When comparing the groups against each other, but also the different levels internally, one of the most prominent finding were the fact that the distribution companies use operational indicators in majority. This result is however not completely

surprising due to the nature of distribution companies' business. Another interesting finding is that both distribution companies, omni-channel retailers and parcel agents state that they measure performance connected to their customers. However, what they measure specifically differ slightly between the different groups. The overall impression is that omni-channel companies have a more consumer related approach when choosing their indicators. One frequent conception amongst the interviewees were that measuring customer satisfaction was hard to do in a sufficient way.

Nevertheless, a majority of the interviewees reported that the companies they represent measure everything that they wish to measure. Reporting that if they would identify a need for a new performance indicator, they would find a way to measure it. This confidence is probably a result of the studied context being one with a lot of available data. Some stakeholders even described that they had too much data and not enough capacity to analyze it sufficiently. One possible explanation to this might be the difficulty to identify which data to use and how.

Only a few strategic measurements were mentioned which could be due to the fact that strategic decisions are often discussed on the higher levels of a company and the respondents may not be as willing to share information regarding strategic performance as with operational and social performance. Although specifically asked for what indicators were used, and not levels of performance, it is possible that the company representatives declined to answer as they considered it to be a company secret.

The studied business field currently experiences a lot of innovative solutions, however no performance measurements regarding innovation were mentioned. A reason for this might be the difficulty of measuring innovation and does hence not show that companies are non-innovative. Rather the interviews indicated that the different stakeholders are trying to look into the future to find innovative solutions continuously, even if they do not measure the innovation per say.

4.7 Challenges for stakeholders

Frequently mentioned during conducted interviews were the shortage of specific data provided by another stakeholder. As an example, the omni-channel retailers mentioned that they wanted to know how big their CO_2-

emissions related to transportation of parcels were. However, they experienced that they could not get specific enough data from the distribution companies. Instead they got an estimated value based on how many transports they had booked. As a result, the retailers experienced that they could not see what improvements many of their actions to increase sustainability had come to. If the distribution companies cannot offer specific enough data related to their transports, there is a risk that the omni-channel retailers do not get enough incentive to improve. Improvements connected to both parcels and deliveries could result in less CO_2-emissions. At the same time the distribution companies state that they measure everything possible and should thereby theoretically be able to provide this information to their customers. A strong environmental profile also seems to be sought-after by all stakeholders making it vital to provide performance data that can create incentives for more sustainable transports. What remains unclear is however if the retailers have put in a request to the distribution companies for these numbers or not. What measures and calculations the omni-channel retailers have done themselves to achieve an estimation, is also not explored.

Furthermore, the parcel agents wish to, in a better way, analyze the capitalization from customers picking up parcels. Capitalization meaning to what extent customers picking up parcels result in additional revenue in the parcel agents store or equivalent businesses. This is of importance as it is one of the main reasons for the parcel agents' collaboration with distribution companies. In order to do better analyses, the parcel agents would require more specific information related to parcel pick-ups at their collection and delivery point. Currently the parcel agents retrieve aggregated information on the parcel deliveries performed at their collection and delivery point. They would however eventually benefit from retrieving more specific information for example on who is picking up parcels at their location. This data would enable the parcel agents to crossmatch parcel pickups with members shopping data. This comparison would let the parcel agents see how and if parcel pick-ups generate extra revenue. This could create incentives for future parcel agents and for further development of the service provided. It is possible that this would require a very strict contract as it would obligate the distribution companies to share information about the consumers.

5 Results and discussion

In this chapter the last of the research questions is attended. Suboptimization in the current way of measuring performance is identified and a holistic system approach of performance measuring is introduced. Multiple performance indicators for such a system are presented. Different challenges for implementation are also discussed.

RQ3: How could performance measuring of collection and delivery points be improved by a holistic approach?

5.1 Lack of a holistic view on performance measuring

The investigated stakeholders constitute three groups in all which performance measurement is present. Omni-channel retailers, distribution companies and parcel agents are businesses with their own orientation and therefore they approach the matter slightly different from each other. A possible explanation for identified differences between stakeholders', when it comes to performance measurement, is that they have different roles or positions relative each other. See Figure 16 for a description of the relationships between the different stakeholders.
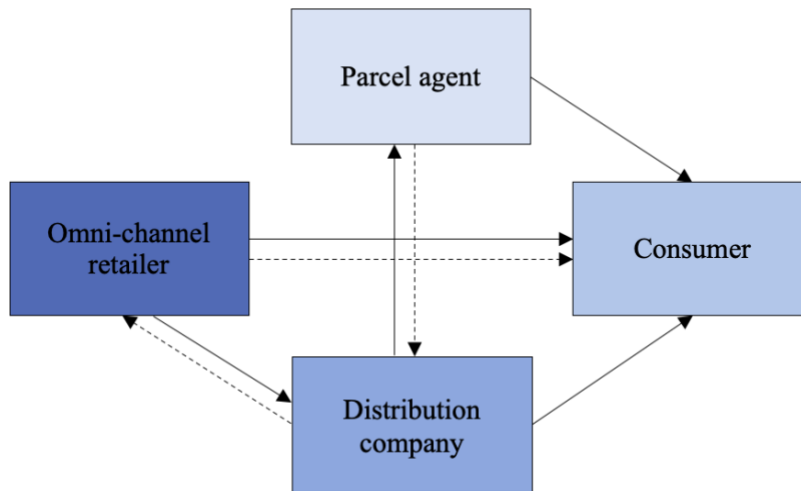
Figure 16: Stakeholder relationships described with dotted lines from the service provider to its first-tier customer and goods flow with continuous lines (own illustration)

The figure demonstrates the relationships, in the context of e-commerce deliveries, between four stakeholders: omni-channel retailers, parcel agents, distribution companies and the consumer. It is evident that the overall system is incomplete in its connections between stakeholders and one thing noticeable is that the consumer constitutes a first-tier customer only directly linked to the omni-channel retailer. A consequence of the missing links is that last mile e-commerce distribution becomes suboptimized. Suboptimization meaning that the subsystems, comprised by the different groups of stakeholders, are not optimized from a system perspective but rather from each group of stakeholders. In general, an optimized subsystem will not optimize the outcome for the system as a whole. Suboptimization could also be identified within the different groups of stakeholders.

5.2 What indicators to use in a holistic systems approach

By taking on a holistic view and applying a systems perspective when it comes to performance measuring a number of improvements could be made. Incentives for cooperation between the different stakeholders in the overall system would be created. Cooperation between stakeholders could lead to the avoidance of suboptimization and new synergies could be found. A holistic system perspective when it comes to performance measurement of collection and delivery points could enable a more sustainable and

optimal total system. Stakeholders will most likely need to compromise, and increased profit will not be the sole goal of the system. To be able to cooperate on a system level and consider all parts of the system a balanced scorecard could be applied. The balanced scorecard could enable the stakeholders to understand the importance of measuring performance of the system, by giving a report on a holistic level. The challenge is to find a way through which every stakeholder feels content but at the same time increase other benefits related to for example sustainability and consumer satisfaction. By making these necessary trade-offs it would be possible to extend the efficient frontier as described in the theoretical background, see Figure 4.

For performance measuring from a systems perspective suggested key performance indicators are presented. These KPIs would enable the stakeholders to measure and improve the overall performance for the system. If the stakeholders embrace a system perspective for measuring performance of collection and delivery points, several improvements could be possible. An overall system where all the stakeholders consider each other could create potential to improve all parts of the system. The suggested holistic performance indicators are shown in Figure 17 and discussed in the following sections.

	Social (People)		Economic (Profit)		Environmental (Planet)
Societal level	- Accessibility - Proximity to consumer				- CO_2 emissions - Share emission free vehicles - Cardboard usage - Congestion

	Risk and resilience	Captial utilization	Service and revenue	Efficiency and cost	Capability for innovation
Strategic level	- Service interruptions	- Utilization - Fill rate	↘ ↙ - Cost per shipment - Revenue per shipment - Profitability - Collected parcels		- Impact of holistic perspective

	Quality	Speed	Dependability	Flexibility	Cost
Operational level	- Customer value proposition - Problems - Warranty costs - Damaged goods - Customer support	- Lead time - Laytime at the collection and delivery point	- ETA/Delivery accuracy	- Relocated parcels - Availability	- Returns

Figure 17: Suggested KPIs for measuring performance from a holistic system perspective

5.2.1 KPIs on a societal system level

Accessibility and *proximity to consumer* are performance indicators of interest for a systems perspective. A holistic view and measuring would help optimize these areas out of an overall system approach. An optimization of these measures would create clear benefits for the consumers and satisfied customers will ultimately create more revenue.

On the societal level performance related to sustainability should have high potential to be improved by measuring out if a systems perspective. The main reasons that improvements should be carried out on a sustainability level is that a higher integration between different stakeholders and different groups of stakeholders would enable more coordinated transports and less *CO_2-emissons*. For example, it could enable the distribution companies to develop aggregated distribution hubs. Distribution hubs

would enable smarter transports both in rural and city areas. In cities the distribution hubs can be a crucial part in coordinating sustainable last mile deliveries with filled vehicles. In rural areas it can contribute to more profitable solutions as each company does not have to provide service in all areas. Suggested performance indicators on the environmental level does hence relate to measuring the potential improvements that could be obtained through a more efficient coordination of vehicles. The stakeholders aim to increase the *share of their transports performed with emission free vehicles.* By measuring this indicator on a system level, the stakeholders can collaborate and find more possible routes to perform with these vehicles and increase the share.

Further improvements that can be obtained are related to *congestion.* If transports are integrated to a higher extent, fewer transports should be performed in critical areas and hence the risk of congestion could be lowered. Congestion can also be prevented by the extended communication a system perspective would require and by having a united goal to work toward decreased levels of congestion.

When considering the whole system *cardboard usage* should also be measured. Considering other stakeholders and applying a system perspective, improvements and innovations should be incentivized by this KPI. For example, during one interview it was discussed that an omni-channel retailer would like to provide a more expensive, no packaging material alternative but it required better cooperation in the distribution chain. This delivery option could be enabled if a systems approach was applied.

5.2.2 **KPIs on a strategic system level**

When applying a system perspective and finding ways to avoid suboptimization benefits can be obtained on a strategic level if the right performance measurements are applied. The KPIs suggested by the authors enable the stakeholders to monitor the improvements reached on the strategic level when the stakeholders apply a systems perspective and starts coordinating their distribution accordingly. Coordination from a system perspective could result in higher *utilization* and hence it is suggested that this is closely monitored. The increased utilization should also affect the *fill rate* and *costs* and thus the authors suggest that these aspects are measured as well.

Service interruptions on a system level is important to measure to determine if the overall system works. By measuring with a holistic perspective, it can be investigated if the system approach will lead to a lowered risk and higher resilience causing fewer interruptions. Fewer interruptions in the distribution network will benefit all stakeholders.

Revenue and cost per shipment both contribute to determining the *profitability*. These indicators should be measured as profitability of the overall system can show whether the overall business is viable. Rate of *collected parcels* are an interesting indicator to see if a system approach and collaboration between stakeholders could affect the consumers to retrieve their parcels more often.

Furthermore, it is suggested to use performance measures regarding innovation. The proposed measurement, *impact of holistic perspective*, would give the stakeholders a hint about innovative thinking, sprung out of the system perspective. To make the system approach viable, and enhance performance, innovation will be needed. Challenges, and the solution of these, that comes with the new holistic approach will push the business forward. Measuring innovation and the outcome of innovation will create motivation for further development.

5.2.3 KPIs on an operational system level

On the operational level several improvements can be achieved by approaching deliveries through collection and delivery points with a system perspective. The *customer value proposition* is linked with several suggested KPIs on the operational level. By measuring the suggested KPIs on the operational level the stakeholders throughout the supply chain would follow the customer value proposition closely and always make sure that it is kept by monitoring the different indicators. The customer value proposition also includes obligations and responsibilities between the different stakeholders and by applying a system perspective the stakeholders would be more equipped to face possible challenges together. Furthermore, improved results for the overall system could be obtained if stakeholders work together to approach occurring *problems* in the supply chain. By addressing and measuring these problems, the stakeholders would be able to decrease *warranty costs* and *damaged goods*, and hopefully retrieve less negative feedback from their *customer support*.

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By measuring and working with indicators on an aggregated level, big cost drivers can be addressed with a holistic view. For example, the *laytime at the collection and delivery points* is essential to measure at a system level as it is one of the main cost drivers of the system. The laytime drives costs as it effects the utilization of the collection and delivery points. By measuring and analyzing the laytime on a system level the stakeholders could find new business opportunities. For example, the stakeholders could create incentives for the customer to decrease this laytime if it would be associated with a lowered delivery cost.

If working together the stakeholders should also be able to measure a more explicit *lead-time* and hence provide a more specific Estimated Time of Arrival, *ETA*. The current issues of obtaining ETA information from the other stakeholders has forced the stakeholders to focus solely on the lead time they can affect themselves. By having access to a systems perspective an overall ETA should be available and the stakeholders should be able to work together to reach and measure said ETA. Being able to work towards an ETA throughout the supply chain would also enable all stakeholders to plan their respective deliveries more closely.

Related to the flexibility category indicators measuring *relocated parcels* and *availability* in the overall system should be adopted. This is suggested as a holistic approach should enable the stakeholders to obtain more flexibility through cooperation. The availability is related both to availability to perform a delivery through a specific collection and delivery point and the availability of several delivery options. Both aspects could be improved if cooperation between stakeholders would be developed.

It is further suggested that the stakeholders should measure *returns* through a system perspective. By addressing returns on this level the system could optimize the return flow which would be beneficial especially for the omni-channel retailers but also for the entire system of stakeholders, including the consumer.

5.3 Challenges related to implementation

Challenges that could hinder the implementation of a holistic view were identified. The main challenges identified consist of problems related to

cost and benefit sharing as well as information and data sharing. The absence of cost and benefit sharing leads to a reluctance or hesitation among stakeholders to embrace a holistic approach. Stakeholders might also ask themselves why they should share information and data, applying an overall system perspective, when they struggle to see the benefits of doing so.

The subject of information sharing was mentioned several times during the interviews. Overall findings regarding information sharing were that the discussion has multiple sides to it. Stakeholders that are opponents to information and data sharing argue that it would disturb the competition in the field. Others imply that information and data sharing mostly would be beneficial for the big actors in the business field and that it would be the end for the smaller actors. One could also argue that there might be other underlying reasons to why the stakeholders perhaps actively choose not to share information and data. If the majority of their customers seem satisfied, they could question if the relations between stakeholders actually get affected by the lack of information sharing. Some stakeholders were however positive about sharing data or at least information, understanding the importance of collaboration for future innovations and improvements. One important aspect is indeed that different distribution companies should be able to cooperate without sharing their performance data. They should for example be able to coordinate their transports through common distribution hubs without sharing data that the companies consider being classified. Information sharing does not necessary include data sharing and could constitute a middle ground in the debate.

The challenges described will affect the feasibility of a holistic systems perspective. In addition to mentioned challenges the competitive relationship within the field aggravate the feasibility further. However, even if implementation seems problematic the authors believe the proposed approach to be feasible, at least to some extent.

6 Conclusion

This chapter concludes the result of this thesis and discusses what contributions the thesis has resulted in. The chapter also gives suggestions on future research within this field.

6.1 Key findings

Stakeholders connected to collection and delivery points use performance measurement to asses and develop their businesses. The different stakeholders use performance indicators on all three levels; societal, strategic and operational. The most significant findings were that distribution companies use a majority of operational performance indicators, probably due to the nature of their business, and omni-channel retailers have a prominent consumer focus.

The last mile distribution network consists of multiple collection and delivery points and every stakeholder measure and asses the delivery options with their own business in focus, lacking the overall view. Currently the different groups of stakeholders form sub-systems, with every stakeholder measuring from the viewpoint of their own interests. By implementing performance measurement on a holistic system level and developing further integration between the different stakeholders a more optimized system could be created. A holistic view for performance measurement could lead to synergies and an extension of the efficient frontier. Hence a more efficient overall system would be created. Challenges related to data and information sharing as well as the absence of cost and benefit sharing will however most likely create resistance amongst stakeholders.

6.2 Research contribution

Potential improvement of performance measuring related to collection and delivery points has been identified. Presented suggestions can contribute to progression within the field. If the proposed solution is implemented it has the potential to contribute to a more sustainable, in terms of social, economic and environmental, future in last mile distribution.

The identified research gap regarding performance measurement of collection and delivery points has been addressed through the execution of this thesis. In the emerging practice this thesis has constituted a first step towards further research for improvements within the field. Gathered and presented data contributes to overall insights in the field as it identifies present suboptimization and addresses how to optimize from a holistic system perspective. This thesis has contributed to the research field by the identification of potential improvements which can be further investigated by additional research.

6.3 Suggestions for further research

To find a viable solution of how to implement the ideas brought to life thru this master thesis will be a vast and highly interesting task. Future research is needed to determine if the proposed solution would be applicable in the industry and how this implementation should be carried out.

To further develop the insights in the studied area the following suggestions are made for additional research. Future research could consist of increasing the number of respondents interviewed from respective stakeholder group. This could result in additional identified performance indicators and hence the discussion regarding measures could be extended. The research could also be developed by conducting interviews with additional representatives, with different areas of responsibility, at the different companies. This would be interesting as it could result in a more comprehensive view of the performance indicators used by the companies.

The research could also be developed by including collection and delivery points delimited in this thesis. By including delivery options such as home delivery and pickup at distribution center a more complete representation of

the collection and delivery system could be achieved. It would also be of great interest if it would be possible to interview more representatives from stakeholders providing parcel lockers. It would especially be interesting to include representatives from companies that offer parcel lockers exclusively.

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Appendix A - Interview questions

Appendix A contains the interview questions used during the semi-structured interviews. Five sections of questions are presented, each adapted for different stakeholders interviewed during the study.

A.1 Interview questions for the distribution companies

Introduction questions
1. What is your role at the company?
2. How many years of experience do you have?
3. Do you have experience within the field from previous roles?
4. What are your thoughts on e-commerce in general?
5. What trends do you think will have big impact in the future? How will the trends effect your company?

General questions
6. What types of collection and delivery points do you use?
   a. Parcel agents?
   b. Parcel lockers?
   c. In-store pickup?
   d. Other?
7. How do you optimize your distribution network?
8. How do you determine that there is a need for a new collection and delivery point?
9. How do you collaborate with the collection and delivery points?
   a. Design of contract?
   b. Cost of collaboration?
   c. Different options relative each other?

Performance measurement
10. Do you measure performance of your collection and delivery points?
    a. How?
11. Which factors are important?
    a. Why?
    b. How do you choose them?
    c. How do you choose your target levels of performance?

12. How is the data obtained?
    a. Provided by collection and delivery point?
13. Do you use the performance data?
    a. How?
14. Do you track your performance, improvements and/or negative trends?
15. Do you compare the performance of your different collection and delivery points? (Relative each other.)
16. Are collection and delivery points that excel in performance rewarded?
    a. How?
17. Do you compare your performance in regard to other distribution companies?

With regard to the figure including the strategic, operational and social level, describe and then ask:

18. Do you measure performance on the societal level?
    a. For example: Employee satisfaction, health and safety, gender balance
19. Do you measure performance on the strategic level?
    a. For example: service interruptions, capacity utilization, profitability
20. Do you measure performance on operational level?
    a. For example: Customer complaints, throughput time, lateness complaints, machine efficiency?
21. We have heard about a project, carried out by Sveriges Paketombud, that discusses a collaboration between distribution companies in smaller cities, is that something you have been a part of or heard of?
    a. What are your thoughts?
    b. Do you think there can be a situation where you choose to share information with you competitors?

Development
22. Who has the responsibility for developing the collection and delivery points?
    a. How is it developed?

A.2 Interview questions for omni-channel retailers

Introduction questions
1. What is your role at the company?
2. How many years of experience do you have?
3. Do you have experience within the field from previous roles?
4. What are your thoughts on e-commerce in general?
5. What trends do you think will have big impact in the future? How will the trends effect your company?

General questions
6. What types of delivery options do you provide?
   a. Parcel agents?
   b. Parcel lockers?
   c. In-store pickup?
   d. Other?
7. How do you optimize your distribution network?
8. How do you determine that there is a need for a new delivery option?
9. How do you collaborate with the distribution companies?
   a. Design of contract?
   b. Cost of collaboration?
   c. Different options relative each other?

Performance measurement
10. Do you measure performance of your delivery options/companies?
    a. How?
11. Which factors are important regarding delivery?
    a. Why?
    b. How do you choose them?
    c. How do you choose your target levels of performance?
12. How is the data obtained?
    a. Provided by distribution company?
13. How do you use the performance data?
14. Do you compare the performance of your different distribution service providers? (Relative each other.)
15. Are delivery companies that excel in performance rewarded?

With regard to the figure including the strategic, operational and social level, describe and then ask:
16. Do you measure performance on the societal level?
    a. For example: Employee satisfaction, health and safety, gender balance
17. Do you measure performance on the strategic level?
    a. For example: service interruptions, capacity utilization, profitability

18. Do you measure performance on operational level?
    a. For example: Customer complaints, throughput time, lateness complaints, machine efficiency?

Development
19. Who has the responsibility for developing the collection and delivery points?
    a. How is it developed?

A.3 Interview questions for parcel agents

Introduction questions
1. What is your role at the company?
2. How many years of experience do you have?
3. Do you have experience within the field from previous roles?
4. What are your thoughts on e-commerce in general?
5. What trends do you think will have big impact in the future? How will the trends effect your company?

General questions
6. Do you accommodate several collection and delivery alternatives?
   a. Parcel agent?
   b. Parcel lockers?
   c. Other?
7. How do you decide if you want to become a parcel agent for a distribution company?
8. How does your collaboration with the distribution companies work?
   a. Design of contract?
   b. Cost of collaboration?
   c. Different options relative each other?

Performance measurement
9. How do you optimize the service you provide as parcel agents?
10. Do you measure performance for your parcel agent service?
    a. How?
11. Which indicators are important for you to measure?
    a. Why?
    b. How do you choose them?
    c. How do you choose your target levels of performance?
12. How is the data obtained?
    a. Provided by distribution company?
    b. Provided by omni-channel retailer?
13. How do you use the performance data?
14. Do you compare the performance of your different parcel agent locations? (Relative each other.)
    a. How?
15. Are parcel agents that excel in performance rewarded?
    a. How?

With regard to the figure including the strategic, operational and social level, describe and then ask:

16. Do you measure performance on the social level?
    a. For example: employee satisfaction, health and safety, gender balance
17. Do you measure performance on the strategic level?
    a. For example: service interruptions, capacity utilization, profitability
18. Do you measure performance on operational level?
    a. For example: customer complaints, throughput time, lateness complaints, machine efficiency

Development
19. Who has the responsibility for developing the parcel agent?
    a. How is it developed?

20. How is the collaboration with parcel lockers designed?
    a. Who decides if there should be a collaboration? Does each store decide on its own?
    b. Who do stores decide to collaborate?
    c. Do you use specific performance measurements for the lockers?

A.4 Interview questions for Helsingborg City

Introduction questions
1. What is your role at Helsingborg City?
2. How many years of experience do you have?
3. How has your role changed over time?

General questions
4. Have you as a city recognized a shift in shopping patterns?
    a. Are more people shopping online?
    b. Have you noticed an increase in last mile deliveries?
5. Do you know if Helsingborg City would like to optimize and make decisions regarding the distribution network in your city?
6. What are your thoughts about a city owned distribution network (for e-commerce deliveries)?
    a. How could this improve and optimize?
        i. Emissions?
        ii. Service for customer?
        iii. Other?
    b. Synergy effects with other transportations already in place?

Performance measurement
7. Do you work with performance measurement?
    a. How?

A.5 Interview questions for Sveriges Paketombud

1. What is Sveriges Paketombud and what are you working with?
2. We have read about your project "nationell ombudsplattform", would you like to tell us more about that project?
    a. What does the distribution companies think about this project?
    b. Do the distribution companies want to share their data?
    c. Do you think the project has a higher likelihood to succeed in rural areas?
3. You are also discussing collective distribution, but you mention that it is difficult to persuade the distribution companies to collaborate, how do you think it will work in the future?
4. Generally, what do you think the future holds for e-commerce and distribution services?

Appendix B - Observation points

B.1 Observation points

B.1.1 Parcel agents

Location/Service provider	Date of observation	Time of observation	Distribution company
Coop Mårtenstorget, Lund	2020-05-19	13.25	PostNord
ICA Kvantum, Nova, Lund	2020-05-19	14.05	PostNord
Leveriet, Mobilia, Malmö	2020-07-03	11.20	PostNord, DHL, Bring, DB Schenker, UPS
EWAY, Burlöv Center, Arlöv	2020-07-03	13.05	PostNord, DHL, DB Schenker

B.1.2 Parcel lockers

Location	Date of observation	Time of observation	Distribution company
Åhléns, Lund	2020-05-19	13.05	Instabox
Coop Mårtenstorget, Lund	2020-05-19	13.20	Instabox
LYKO, Lund	2020-05-19	13.40	Instabox
Mobilia, Malmö	2020-07-03	11.15	Instabox
Mobilia, Malmö	2020-07-03	11.15	DHL Swipbox
Willys, Staffanstorp	2020-07-10	12.15	DHL Swipbox

B.1.3 In-store pickup

Location	Date of observation	Time of observation	Service provider
Åhléns, Lund	2020-05-19	13.10	Åhléns
KappAhl, Mobilia, Malmö	2020-07-03	13.10	KappAhl
Stadium, Mobilia, Malmö	2020-07-03	13.20	Stadium