Off-Peak Deliveries from a Business Model Perspective

KATARINA ALLMÉR
SOFIA FEYCHTING

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Katarina Allmér
Sofia Feychting

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KTH Industrial Engineering and Management
Industrial Management
SE-100 44 STOCKHOLM
Abstract

With an increasing urban population around the world, the need for urban freight distribution is constantly growing. Many cities face problems with traffic congestion, especially during peak hours in the morning and afternoon. At the same time, the roads are often nearly empty during nighttime. In some cities, like Stockholm, heavy haulage is not permitted to enter the city during the night. This means that carriers are forced to perform these deliveries during the day, which leads to inefficient distribution.

To investigate the possibilities to use nighttime hours for deliveries, which could lead to a more efficient distribution system and increased sustainability of the city, a pilot project has been initiated by the City of Stockholm to test off-peak deliveries. Other similar trial projects have encountered difficulties with getting businesses to participate, and the incentives to shift to off-peak deliveries have been unclear. Therefore, this thesis aims to investigate what incentives there are for actors within a supply chain to make this shift and the key factors that enable the supply chain to benefit.

The thesis is performed as a case study on the pilot project in Stockholm, and uses a business model perspective to analyze how value is created and captured throughout the supply chain. The results show that there is potential for supply chains to increase its total value through off-peak deliveries as a result of increased efficiency, improved delivery reliability and increased utilization of trucks. Pricing models and relative negotiation power between actors have a large effect on how the value is distributed. The main contributors to creating increased value are sufficient delivery volume, compatible processes, and full utilization of trucks. The possibility to use off-peak deliveries for marketing is relatively unexploited and could potentially create more value.

Key-words
Off-peak deliveries, urban freight distribution, sustainable transport solution, value creation, value proposition, value capturing
Sammanfattning


För att undersöka möjligheterna att utnyttja nattens timmar till leveranser, vilket skulle kunna leda till ett mer effektivt distributionssystem och en ökad hållbarhet för staden, har ett pilotprojekt initierats av Stockholms Stad för att testa nattliga leveranser. Andra liknande projekt har stött på problem med att få företag att delta, och incitamenten för att flytta leveranser till nattetid har varit otydliga. Därför syftar detta arbete till att undersöka vilka incitament som finns för aktörer inom en försörjningskedja att göra detta byte och vilka huvudfaktorer som möjliggör att kedjan kan dra fördel av det.


Nyckelord
Nattliga leveranser, godsleverans i städer, hållbar transportlösning, värdeskapande, värdeerbjudande, värdefångst
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1 Introduction

This chapter provides a background for the master thesis. Why there is a need to further investigate off-peak deliveries is explained and the purpose and research questions are described. The scope of the study as well as its contribution and structure concludes this chapter.

1.1 Background

As the population and the economic growth in urban areas have continued to increase during recent decades, the demand for urban freight transportation has also increased. Road-based transportation of goods has a large negative impact on cities since it contributes to traffic congestion, air pollution and noise pollution. There is a dependency on goods transportation by road, which creates a need to promote a more sustainable transport industry in order to reduce negative effects such as greenhouse gas emissions (Browne, et al., 2012).

There should be considerable incentives for the industry to achieve increased transport efficiency, given that it implies reduced resource consumption without lowering performance. Being able to decrease costs can often lead to a lowered environmental impact as well, especially in regard to transport efficiency, which would benefit the industry as well as the society (Arvidsson, et al., 2013). However, the efficiency of urban goods distribution is often low and there is high degree of resistance when it comes to industry changes. The insufficient rate of new implementations to increase the sustainability of the industry is even more problematic considering that many problem areas within transport have already been identified and several solutions and improvements have been discussed and accepted; yet few are developed into action and implemented (Arvidsson, et al., 2013). In general, the profit margins of carrier companies are very small, which reduces the ability to make new investments into transport efficiency; many carriers can simply not afford it, even if the large investments are profitable in the long run (Holguín-Veras, et al., 2014).

Several cities in the US and in Europe are promoting cargo deliveries during off-peak hours in urban areas as a way to reduce traffic congestion and improve the sustainability of urban goods transportation. A shift to nightly deliveries has proved successful as a way to make the deliveries more efficient. Trial runs in New York city showed that the trucks were able to reach their first stop 75 % faster and the following stops 50 % faster when delivering goods during off-peak hours (Rudra & Verrall, 2013). Other investigations of off-peak deliveries show that it creates great opportunities for the transport companies to increase their utilization of the trucks, as well as improving the working conditions for the drivers (Holguín-Veras & Hart, 2012).

Many stores, restaurants and hotels expect to receive goods during a short time span during the morning hours in order to have a complete stock as the business day starts (Cherrett, et al., 2012). Previous studies of off-peak deliveries show that by switching to off-peak deliveries, these requirements can still be met but with a better reliability of the deliveries since there is no risk of congestion affecting delivery times. Furthermore, the utilization of the trucks can be improved through both nightly and daily deliveries, which can lead to possibilities such as decreasing the number of trucks in the fleet (Georén, 2015). Hence, off-peak deliveries have the potential to contribute to more efficient cargo transportation, thus improving the sustainability of the delivery industry.

In Stockholm, there are also concerns regarding heavy traffic congestion and air pollution caused by the transport sector. Similarly to other European cities there are restrictions in Stockholm regarding heavy haulage during nightly hours due to noise pollution caused by the vehicles and the unloading of goods. After 10 pm and before 6 am it is prohibited to drive heavy
haulage (over 3.5 tons) in most parts of the inner city of Stockholm (Traffic administration, City of Stockholm, 2012). Instead, haulage contributes to the daytime traffic congestion in the city and the efficiency of deliveries is low. Therefore, the City of Stockholm has initiated a project with the purpose of evaluating the benefits of allowing trucks to deliver goods during off-peak hours. The project is a collaboration that also includes Svebol Logistics AB, Lidl Sverige KB, Martin & Servera, Scania CV AB, AB Volvo, the Royal Institute of Technology and Chalmers. The Royal Institute of Technology acts as a coordinator of the project. The field trials started in 2014 and will continue throughout 2016 with two trucks delivering goods to three Lidl supermarkets and a limited number of restaurants and hotels.

Rescheduling deliveries from daytime to off-peak hours affects all parts of the supply chain differently, and in order to establish a willingness to participate there is a need to determine clear incentives for each actor. The stakeholders involved in off-peak deliveries constitute a system and there must be an added value, or at least not a loss, for each participant and for the system as a whole in order to accept a transformation within the system. There is also a clear interdependency within the system; the transport companies cannot deliver goods at night if the stores and restaurants are not willing to handle goods reception during these hours. However, it is not clear whether all of the stakeholders will benefit from being a part of off-peak deliveries. Off-peak trials in other cities have experienced difficulties in convincing certain stakeholders to be a part of an off-peak delivery system. The delivery solution has been successful for some participants while quite many have ended their participation after the trial period was over, according to Holguín-Veras et al. (2014). Different conditions, logistical structures and business structures among the stakeholders have a large impact on the success rate of nightly deliveries and needs to be investigated further. When reviewing the difficulties of previous attempts it is evident that the stakeholders are not able to take full advantage of the value created through off-peak deliveries. Therefore, this thesis aims to investigate what incentives there are for actors within a supply chain to make this shift and the key factors that enable the supply chain to profit. How value is created and captured through off-peak deliveries will therefore constitute the key part of the investigation of off-peak deliveries in Stockholm.

The efficiency gains, as a result of off-peak deliveries, are turned into savings within the supply chain. Depending on where in the supply chain the efficiency gains are created, and depending on the pricing models used between the stakeholders, more savings will be distributed to certain stakeholder while some might not achieve any savings at all from off-peak deliveries. Depending on the different processes and resources of the stakeholders, the value creation will differ from case to case. The interactions between the stakeholders will also impact the value creation and value capturing. In order to take part in the pilot project in Stockholm, the carrier has to operate eco-efficient trucks and this will most likely be a requirement of any future nightly permit; hence off-peak deliveries has to generate enough saving for the stakeholders for them to afford more expensive trucks and equipment. There is potentially a great deal of value that can be created when switching to off-peak deliveries, not just for the active participants in the supply chain but also for the city of Stockholm and the truck manufacturers that provide the distribution with a new kind transport solution: quiet goods transportation at night.

This master thesis is conducted on behalf of Scania, with the purpose of increasing their understanding of this new transport solution. In order to provide its customer with the right kind of products and service, there is a need to understand not just the customer but also the customer’s customer and the supply chain as a whole.
1.2 Purpose

The purpose of this thesis is to increase the knowledge about what incentives there are for actors within a supply chain to switch to off-peak deliveries. To understand this, it is important to investigate how value is created within the supply chain when switching to off-peak deliveries, and how this value is captured and distributed between the stakeholders. Based on this, it is possible to identify the key aspects that make off-peak deliveries beneficial for the stakeholders and how to further increase the value created from the new transport solution.

1.3 Research Question

Based on the purpose of the thesis, the following research questions have been formulated:

- How is value created from off-peak deliveries and how is this value captured and distributed between the stakeholders?
  - What are the key factors that enable the stakeholders to benefit from off-peak deliveries?

Based on the results of the investigation of the first research question, possibilities to create or capture more value will be analyzed; thus the following question will be answered:

- Which factors allow more value to be created and captured from off-peak deliveries?

1.4 Delimitations

The investigation will focus on the pilot project in Stockholm; hence the off-peak trials in other cities will only be used to gather secondary data to gain more knowledge about the transport solution.

For the purpose of this thesis, off-peak deliveries are defined as deliveries that occur between the hours of 22:00-06:00, which was previously a restricted time zone for deliveries with heavy haulage in Stockholm City.

The interactions between the stakeholders can be seen as part of a system surrounding off-peak deliveries. The carrier, shipper and receivers make up a part of the supply chain that will be affected by off-peak deliveries. The truck manufacturer is also considered a stakeholder since it is affected by the value that is created by more efficient deliveries and its offering is part of the conditions that enable the existence of off-peak deliveries.

The study will not contribute with any new conclusions regarding the environmental impact of cargo deliveries at night, nor will the noise levels of the deliveries be investigated further. It is also not part of the scope to quantify all of the costs and savings within off-peak; instead the intention is to create an understanding of how the costs and savings impact the incentives of the different stakeholders through qualitative interviews.

The regulations regarding off-peak deliveries that the City of Stockholm will formulate will only be used as boundary conditions in the case study. Assumptions regarding the future policy will be made based on interviews with the City of Stockholm and used in this case. The benefits and the weaknesses of the transportation solution for the City of Stockholm and the society will be a part of the context.
1.5 Contribution

The thesis will contribute to an increased understanding of how adding a night shift within a supply chain affects the stakeholders individually and as part of a system in regard to the value that is created and captured.

The practical contribution is to increase the understanding of the incentives that exist for companies to switch to off-peak deliveries and the key factors that enable the supply chain to benefit from this transport solution.

1.6 Disposition

The disposition of the thesis is outlined as follows;

1. **Introduction**
   This chapter includes background to the research, as well as purpose, research question, delimitations and contribution.

2. **Methodology**
   The chosen method and research design is presented in this chapter.

3. **Literature Study**
   This chapter includes a review of relevant literature and the theoretical framework is presented.

4. **Empirical Background**
   The empirical background includes previous studies of off-peak deliveries and a description of the pilot project in Stockholm. A presentation of the client company concludes the chapter.

5. **Empirical Study**
   The empirical data is presented in this chapter and analyzed in accordance with the theoretical framework.

6. **Discussion**
   This chapter presents a discussion regarding the findings and a generalization of the results.

7. **Conclusion**
   In this chapter, a conclusion regarding the findings is presented as well as a recommendation for future research.
2 Methodology

In this section the methodology used in this study is presented. First, the research approach is discussed and motivated, followed by a description of the research process and a discussion of the validity and reliability of the study.

2.1 Research Approach

The research of this thesis has been performed as a case study. According to Eisenhardt (1989), the case study is a research strategy that focuses on understanding the dynamics present within single settings, and is particularly appropriate when little is known about a specific phenomenon or current perspectives seem inadequate. A case study provides in-depth knowledge of a phenomenon explored within its natural setting where the context is essential (Collis & Hussey, 2014). Since the phenomenon of off-peak deliveries is new within the specific settings of Stockholm, the case study is therefore a suitable method to gain deep understanding about the particular circumstances present there. Although drawing generalizable conclusions from case studies is a challenge and needs to be done with care, the results can have high impact and high validity among practitioners (Voss, et al., 2002).

Voss et al. (2002) emphasize the possibility of the case study to be used for exploratory research as one of its outstanding strengths. Exploratory studies are appropriate when there are few existing studies about the specific issue, and are used to find patterns and ideas, and gain insight and familiarity with the problem. They also aim to create rather than test and confirm hypotheses (Collis & Hussey, 2014). The limited research on off-peak deliveries therefore makes this kind of research suitable for this thesis. Because of the complexity of the studied system with the several different actors involved and the relationship between those actors as one of the main units of analysis, this study has focused on qualitative data to achieve sufficient depth and detail.

2.2 Research Process

In contrast to what the following, rather linear description of the research process might indicate, this study is the product of an iterative process with continuous changes of research questions and purpose as well as studied theory, as new discoveries have been made during the course of the research. According to Blomkvist and Hallin (2014), this is common in case study research and usually leads to a more interesting result. Also, the different stages of the research have overlapped and several activities have been performed simultaneously.

The research problem was originally presented by the client, and was thereafter continuously developed and narrowed down in order to reach a focused and relevant research question. This process started with a preliminary investigation of previous off-peak trials, as well as a review of a broad range of literature in order to identify useful theoretical frameworks. The decision to perform the research as a case study was made and the structure and timeline of the research was set up. Collis and Hussey (2014) break down the case study methodology into the following main stages:

1) Selecting the case
2) Preliminary investigation
3) Data collection
4) Data analysis
5) Writing the report
These stages each consisted of several activities, and an overview of the research process with activities performed during each stage is displayed in Figure 1. A more detailed description of each stage of the study follows below.

![Figure 1. Research process](image)

### 2.2.1 Case Selection

The selection of the case happened naturally since the research problem presented by the client was closely linked to the particular case. To study the case of the current off-peak trials in Stockholm was therefore decided from the start, and the research problem and research questions were developed based on the available case. The scope of the case and the actors that were going to be studied were determined. Within the case, two clear sub-cases were identified. The main difference is that in one case the same company acts as the shipper and receiver, and in the other there is a shipper supplying many different receivers. Since this was considered an important difference, it was decided to study the two sub-cases separately and analyze the impact of the different logistic setups. The two different sub-cases are described further below and an overview of the case is presented in Figure 2. Throughout this report the two different sub-cases will, for simplicity purposes, be referred to as “case 1” and “case 2” respectively.

![Figure 2. Overview of the case](image)

Figure 2 displays the supplier-customer relationships within the case, and not the physical flow of goods. The truck manufacturer is not included in the two different sub-cases since its role within off-peak deliveries is indirect.
Case 1

The first sub-case consists of a carrier and a grocery chain. The carrier provides the grocery chain with the service of deliveries to their stores. The goods are picked up from the grocery chain’s own central warehouse, and then transported to stores in and around the city of Stockholm. This means that the grocery chain acts as both the shipper and receiver in this case. The grocery chain is also transport buyer as the customer of the carrier. Within the scope of the off-peak trial project, one electric hybrid truck has permission to deliver to three inner-city stores. The deliveries to these stores are also the subject of study in case 1.

Case 2

In case 2, the participating actors consist of one carrier, one wholesaler, and 10 of the wholesaler’s customers, mostly hotels and restaurants. The wholesaler provides its customers with goods, and the carrier provides the deliveries. The carrier is the same carrier as in case 1, and delivers on behalf of the wholesaler. The wholesaler thereby acts as the shipper and the transport buyer in this case, while the hotels and restaurants act as receivers.

2.2.2 Preliminary Investigation

Collis and Hussey (2014) describe the preliminary investigation as the process of becoming familiar of the context within which the research will be conducted. For this thesis, the preliminary investigation was aimed at gaining a basic understanding of the different actors and the way they interacted within the case, in order to identify aspects that needed further investigation and could pose for a more focused research problem. This was done by conducting semi-structured interviews with representatives of each of the key stakeholders about their own participation in the trials. The interviews were kept on a high level as the purpose was to gain general knowledge and understanding and therefore there was not much focus on detailed information. The preliminary investigation also had the purpose to establish the context of the study, which was done by interviewing e.g. representatives of the City of Stockholm about the political and legal parameters. The interview subjects and types of interviews conducted during the preliminary investigation are specified in Table 1.

<table>
<thead>
<tr>
<th>Role of interview subject</th>
<th>Type of interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner, carrier company</td>
<td>In person</td>
</tr>
<tr>
<td>Head of Logistics, grocery chain</td>
<td>In person</td>
</tr>
<tr>
<td>Head of Transport, wholesaler</td>
<td>In person</td>
</tr>
<tr>
<td>Transport Efficiency Researcher, KTH, Off-Peak project</td>
<td>In person</td>
</tr>
<tr>
<td>Transport Efficiency Researcher, KTH, Off-Peak project</td>
<td>In person</td>
</tr>
<tr>
<td>Transport Policy Researcher, KTH, Off-Peak project</td>
<td>In person</td>
</tr>
<tr>
<td>Urban Freight Researcher, University of Chalmers, Off-Peak project</td>
<td>Telephone</td>
</tr>
<tr>
<td>Traffic Planner, The City of Stockholm, Off-Peak project</td>
<td>In person</td>
</tr>
<tr>
<td>Traffic Planner, The City of Stockholm, Off-Peak project</td>
<td>In person</td>
</tr>
<tr>
<td>Industrial and Financial Management &amp; Logistics Researcher, University of Gothenburg</td>
<td>Telephone</td>
</tr>
</tbody>
</table>

As another part of the preliminary investigation, a review of previous off-peak trials in other countries was conducted. This was done in order to gain a greater understanding of the off-peak phenomenon and what success factors and challenges had been identified in other projects.
The literature review of this thesis has mainly focused on the existing research about supply chain management, urban freight distribution, sustainable supply chains as well as business models. Search engines, such as the search tool Primo provided by the KTH library and Google Scholar, were used to find relevant articles from peer-reviewed journals, and a large number of articles were read and categorized according to content as suggested by Collis and Hussey (2014). The research performed within this thesis involves changed conditions within a supply chain that affects the supply chain management and urban distribution, and therefore the research within this area was explored. During the preliminary study of previous off-peak trials, a potential problem area was identified to be the value creation and value capture from off-peak deliveries within the supply chain. This was considered to be worth investigating further and formed a preliminary research problem. To study this problem, a business model perspective was deemed suitable to use as a theoretical framework to structure the research. Therefore, research about business models was also included in the literature study. Different definitions of a business model were compared and assessed and from that an appropriate definition to base the study on was concluded. The resulting definition, and the included breakdown of categories, was then used as the foundation of the conceptual framework that was used in order to structure the data collection as well as the analysis of the results. Voss et al. (2002) argue that such a conceptual framework is important, even for inductive research approaches, to understand the general constructs and categories one intends to study, as well as their relationships. This helps to select what key factors, constructs and variables that are important and are to be included in the study.

Based on the information gathered and insights gained in the preliminary interviews and the review of previous off-peak trials, the purpose and research questions were revised to achieve a more focused study.

2.2.3 Data Collection

The first step of the data collection stage is determining the sample that is going to be studied (Collis & Hussey, 2014). In this thesis, the sample was selected naturally based on the actors involved in the pilot project.

The next step is to select the data collection method. According to Collis and Hussey (2014), the methods for data collection used in case studies include documentary analysis, interviews and observation. Interviews are considered an appropriate research method when the aim is to gain an in-depth understanding of a phenomenon and to discover new dimensions (Blomkvist & Hallin, 2014). Because of the complexity of the studied case and many stakeholders involved, interviews were chosen as the primary method of data collection in this study.

The interviews were conducted in a semi-structured manner, with mostly open-ended questions and discussions on relevant topics. Interview guides were constructed beforehand based on the conceptual framework used, to make sure all the important aspects would be covered during the interview. The interviewees were selected in order to make sure all actors were included and on the basis of their knowledge about the involvement in the off-peak project. The interview guides with the covered topics are included in the appendix. Some of the interviews were conducted in person, and some were conducted over the phone. The interview subjects and types of interviews conducted during the data collection phase are specified in Table 2.

The objective with the interviews was to gain a deeper and more detailed understanding about the different actors’ businesses and business models, the benefits and challenges with their participation in the off-peak project, and their relationships and interactions with the other actors in the system. The focus of the interviews was the value creation and value capturing
resulting from off-peak deliveries. The interview subjects were also asked to quantify savings and costs, although in many cases these had not been measured. This meant that conclusions regarding the profitability of off-peak deliveries had to be made in a qualitative manner and based on the interviewees’ perceptions. The limited access to quantitative information hindered the financial impact to be proven, and this was rather discussed as indications.

Table 2. Main interviews

<table>
<thead>
<tr>
<th>Role of interview subject</th>
<th>Type of interview</th>
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<tbody>
<tr>
<td>Owner, carrier company</td>
<td>In person</td>
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<td>Head of Logistics, grocery chain</td>
<td>In person</td>
</tr>
<tr>
<td>Head of Transport, wholesaler</td>
<td>In person</td>
</tr>
<tr>
<td>Manager, restaurant</td>
<td>Telephone</td>
</tr>
<tr>
<td>Manager, catering business</td>
<td>Telephone</td>
</tr>
<tr>
<td>Food &amp; Drink Manager, hotel</td>
<td>Telephone</td>
</tr>
<tr>
<td>District Manager, café chain</td>
<td>Telephone</td>
</tr>
<tr>
<td>Kitchen Manager, restaurant</td>
<td>Telephone</td>
</tr>
<tr>
<td>Purchasing Manager, restaurant</td>
<td>Telephone</td>
</tr>
</tbody>
</table>

2.2.4 Data Analysis

The data analysis within a case study can be performed as within-case analysis or cross-case analysis (Collis & Hussey, 2014). Since this case study involves only one case, a within-case analysis was used. The idea with within-case analysis is to become intimately familiar with the case, which makes it possible to see the unique patterns (Eisenhardt, 1989). Some cross-case analysis was also used to compare the two sub-cases.

For the data analysis process in this study, non-quantifying methods were used and a procedure similar to the general analytical procedure, presented by Collis and Hussey (2014), was applied. This procedure includes three simultaneous activities; reducing the data, displaying the data and drawing conclusions. These activities overlap, and start already during the data collection phase.

The reduction of data involves activities such as selecting, focusing and simplifying the data collected (Collis & Hussey, 2014). During the interviews, a large number of topics were covered and some of the information gathered was later determined to be irrelevant and therefore discarded and not presented in the results and analysis. The reduction was done by categorizing the data from interviews in relevant categories according to the theoretical framework, and the data that did not fit in any category was discarded.

Displaying data is a way to visually present information, which helps to draw conclusions from complex data (Collis & Hussey, 2014). In this thesis, analyzing relationships between actors as well as internal factors within the stakeholders’ organizations were important, and graphical figures were sometimes used to visualize these results to make them more comprehensible.

Conclusions have been drawn to some extent from early on in the process, although they were kept very open at first. As more data were collected and deeper analysis was conducted, some conclusions changed and others grew stronger.

2.2.5 Writing the Report

The writing of the report has been done continuously throughout the research project, with the main portion of the workload concentrated at the end. This has also been an iterative process,
starting with short drafts of some of the sections and adding to and changing the content as the work progressed.

2.3 Validity and Reliability

In this section, the validity and reliability of this thesis will be discussed. The discussion will follow the framework proposed by Gibbert et al (2008). With this framework, the authors suggest four aspects, three on validity and one on reliability, which should be used when evaluating a case study. These aspects are explained and presented below, followed by a discussion about their application to this study and identified areas of improvement.

Internal validity refers to the causal relationship between variables and results. This involves whether the researcher uses causal arguments and logical reasoning that is strong enough to defend their conclusions. Internal validity can be enhanced using three measures: a clear research framework, pattern matching, and theory triangulation. (Gibbert, et al., 2008) In this study, pattern matching has been attempted by comparing patterns found in this case study with those found in previous studies about off-peak deliveries. However, the internal validity could be improved by comparing patterns more thoroughly with predicted ones and from different contexts.

Construct validity refers to whether the study actually investigates what it claims to, and to what extent the used procedure leads to a correct observation of reality. The aspect of construct validity is important to consider during the data collection phase of the study. Two measures are suggested to enhance construct validity: to establish a clear chain of evidence and to triangulate. (Gibbert, et al., 2008) The construct validity of this study could be criticized on the basis of the lack of triangulation. The results are based almost solely on qualitative data from interviews, and could be improved if quantitative data were used as a complement. The use of surveys could ensure that conclusions could be drawn based upon quantitative evidence. If access was granted, internal documentation from the different involved companies could be used as further evidence for analyses and conclusions.

External validity, also called generalizability, is based on the idea that theories must be proven to apply to studied phenomena not only in the particular setting in which they are studied, but in other settings as well. Methodologists describe two different kinds of generalization: statistical and analytical generalization. Statistical generalization indicates that conclusions drawn from one sample can be drawn about the entire population. Due to its nature, a case study does not allow for statistical generalization. Analytical generalization, on the other hand, refers to generalizations from empirical observations to theory, rather than to a population. At least 4-10 different cases should be studied in order to provide a basis for analytical generalization. To enhance generalizability further, researchers are advised to provide a clear rationale for the case selection, and sufficient details on the case study context, for readers to understand the sample. (Gibbert, et al., 2008) Being a single case study, albeit divided in two different sub-cases, the generalizability of this study can be considered weak. Since the studied phenomenon is rather unexplored in the specific setting, it is difficult to draw conclusions from the results that are guaranteed to be applicable in general. To improve the generalizability of the study, more similar cases would need to be studied and compared.

Reliability refers to the absence of random error, which means that subsequent researchers could reproduce the same results by conducting the study again. Reliability is about transparency and replication. Enhanced transparency can be achieved through careful documentation of research procedures, which can be done by producing a case study protocol that specifies how the study has been conducted. To enhance replication, a case study database
can be set up where notes, documents and narratives are collected and made available to later investigators. (Gibbert, et al., 2008) To increase transparency, the methodology section of this thesis has been intended to be as specific as possible about how the study was conducted. A more detailed case study protocol could, however, have been provided in order to improve the transparency even more. Furthermore, for replication, the interview guidelines used during interviews have been included in the appendix. However, since large parts of the interviews were conducted in a discussion-like manner, some of the topics covered might not be included in the guidelines. To improve the replication of the study, the recordings of the interviews could have been made available to other researchers.
3 Literature Study

This chapter contains an overview of relevant supply chain theories. This is followed by a review of theories regarding business models, which will constitute the theoretical framework for the investigation and analysis. The concept of business models will be broken down into components that have a large impact on off-peak deliveries, thus creating a framework that can be used in the analysis of the empirical data.

3.1 Supply Chains

Supply chains are composed of flows of products or services between business entities that are connected in a complex network (Serdarasan, 2013). The objective of a supply chain should always be to maximize the overall value generated in the chain. This value is also called the supply chain surplus, and is the difference between the value of the final product to the customer, and all costs the supply chain incurs to fulfilling the customer’s request. This means that the supply chain surplus can be increased by increasing the value of the product or service, or by reducing the costs incurred when producing it. Supply chain profitability is the difference between the price of the product and the incurred costs in the chain. The success of a supply chain should be measured by the supply chain profitability, and not the profitability of the individual actors in the chain (Chopra & Meindl, 2013).

The management of supply chains involves coordinating the flows of products or services on a systemic and strategic level, both within and across business entities. Supply chain management can lead to a competitive advantage by reducing costs and increasing customer satisfaction, both for the different businesses and for the entire supply chain. A supply chain is a dynamic and complex system where the different relationships, processes and interactions within the system will impact the value created in the supply chain (Serdarasan, 2013).

According to Morana (2013), supply chain management consists of three elements: the relational structure of the actors within the supply chain, the management of processes within the supply chain, and the management of components within the supply chain. The components can include more physical and technical components such as the structure of the organization, product flows and planning and control methods, while there are also managerial and behavioural components such as leadership structures, risk and reward management and the culture and attitude.

The most common definition, according to Morana (2013), describes supply chain management as “the systematic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole.”

According to Melnyk et al. (2009), supply chain management is relatively new as a research area and academic field of study. It is also relatively new as an area of business development. In the past, the main focus for supply chain management was on purchasing and managing order and information flows. This has changed into a wider focus that also includes management of risk exposure, new product design processes, improving the continuity of supplies or even customer service management. By including a much wider spectrum of responsibilities within the supply chain, the management becomes even more complex.

The theories of supply chain management have also continued to develop but according to Chicksand et al. (2012), there is a lack of consistency within the field. There are also gaps in the theory and there has yet to develop a paradigm surrounding supply chain management. Österle
et al. (2015) also argue that the field has a weak theoretical basis since it has its origin in many different disciplinary studies.

As argued by Melnyk et al. (2009), supply chain management is also changing rapidly due to new technology, more complex customer demands and government initiatives that affect the value creation within the supply chain. Similarly, they conclude that the field largely relies on experiential knowledge originating from practitioners, thus the academic literature is relatively limited. Hence, there is a need to further study changes within supply chain management and how the changes affect the performance within the chain.

Melnyk et al. (2009) also acknowledge that supply chain management is more than an integration of operations, purchasing, and logistics, and stress the point that other issues also need to be analyzed such as strategic partnerships and relationships within the supply chain. Resources and processes as well as relationships within the system determine how value is created and delivered to the customers. External influences also affect the value creation within the supply chain but there is some disagreement regarding which factors to study. With constantly changing processes and networks, the managers of supply chains are not given efficient tools to work well in such an environment, due to the gaps between theory and practice.

### 3.1.1 Urban Freight Distribution

Freight distribution is also a vital part of the supply chain and consists of an intricate web of stakeholders. In this thesis, urban freight distribution is the system that is studied. The importance of a high-performing urban freight delivery system is generally recognized, due to the value of ensuring supplies to stores and other businesses (Österle, et al., 2015). However, there is a lack of attention given to urban freight movement as a research field. According Österle et al. (2015), much more research has been conducted regarding the movement of people in urban environments and it is important to conduct further research on urban freight distribution. Furthermore, coordination, partnerships and collaboration between stakeholders within urban distribution systems should also be emphasized more, since these factors can increase the value created within the system and are considered to be are crucial when developing more sustainable urban freight systems.

Efficiency that can be directly linked to the profitability of a company is usually the factor that determines which measures that will be taken within the urban supply chain, and environmental and social aspects are often disregarded. Consequently, goods distribution still has a negative impact on the environment and contributes to air pollution, noise pollution and congestion (Österle, et al., 2015).

### 3.1.2 Sustainable Supply Chains

More recently, sustainability has been allowed to play a bigger part within the wide scope of supply chain management. Even though many supply chains are far from sustainable, there is an increased awareness regarding the importance of sustainability and more actions are taken to increase the sustainability of supply chains. The efforts that are made into advancing sustainability also contribute to more changes within the supply chains. It can also be the other way around, that constant changes to the structures and configuration of supply chains contribute to companies taking actions to implement corporate responsibility practices (Beske, et al., 2014). The literature commonly accepts that the environment can be positively affected by supply chain management and sustainable supply chains have been receiving increasingly more attention from researchers and practitioners during the last 10-15 years (Rossi, et al., 2013).
According to Seuring and Müller (2008), the definition of sustainable supply chain management can be recognized as “the management of material, information and capital flows as well as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development, i.e., economic, environmental and social, into account which are derived from customer and stakeholder requirements.” Hence, within sustainable supply chain management, there is an emphasis on cooperation among the stakeholders within the system, which is also something that is often present in other academic studies on the subject. The stakeholders do not only consist of the companies within the chain but are also made up of other suppliers, legal authorities and other government branches (Beske, et al., 2014). However, according to Rossi et al. (2013), when initiating environmental actions, the stakeholders often have an internal company view rather than a supply chain view, hence many important aspects are lost.

When implementing initiatives to increase the sustainability of the supply chain, many companies experience a higher efficiency and improved logistics performance and resource utilization (Beske, et al., 2014). As stated by Rossi et al. (2013), it is generally acknowledged that these kinds of initiatives result in a higher performance while at the same time reducing costs. Many companies still view eco-efficient practices as increasing the costs within the supply chain, but in general the literature supports these practices as a strategic way of creating competitive advantage. What is still lacking is literature covering practical applications of environmental initiatives in regard to performance and environmental issues within the logistics industry. Additionally, many companies experience a lack of control of many parts of the supply chain and a lack of competence regarding eco-efficient initiatives. The role of the logistics service providers within these initiatives have also not been studied enough, but considering the lack of control and expertise it would be beneficial to incorporate these actors even more. The collaboration between the stakeholders within the supply chain also needs to intensify since it is often insufficient according to the literature (Rossi, et al., 2013). Furthermore, it is not clear how companies evaluate the environmental effect of the initiatives and the effect of the incurred costs. In regard to the evaluation of eco-efficient practices, there is also a lack of knowledge regarding how the companies measure or perceive benefits that are more difficult to quantify. These softer values are nonetheless important which is why their impact for the companies needs to be studied further.

### 3.1.3 Regulations and Supply Chains

Research on eco-efficient supply chain management have emphasized the impact of several key drivers when aiming to make the supply chain management contribute to an increased sustainability and eco-efficiency. According to literature, the most important driver when developing environmental initiatives is to have supporting regulations in place. After that, market pressure was also considered an important driver according to empirical evidence (Lee, et al., 2014). Many changes within supply chains arise from changes in regulations and can have an impact throughout the supply chain.

According to Österle et al. (2015), there is a lack of awareness amongst companies regarding regulations and government practices that are specifically designed to increase the sustainability of freight operations. Due to the knowledge gap between companies and government, there is a risk that the impact of these initiatives is reduced or that it has a negative effect for the companies if their operations clash with the new regulations or initiatives. Therefore, it is important to involve companies when creating new structures surrounding freight planning in order to increase the understanding of the impact that it will have. This can also lead to a better outcome of the initiatives and increase the effectiveness. Österle et al. (2015) emphasize an increased collaboration between the public and private sector regarding
eco-friendly initiative for freight operations. It is widely known that city logistics projects have a much better success rate with strong cooperation between stakeholders. However, they conclude that there are very few cases to date where the public and private sector have created such collaborations where the companies start to pay more attention to improving freight operation within the overall transport planning process.

3.2 Theoretical Framework for Off-Peak Deliveries

A distinct problem area for the supply chain that is a part of off-peak deliveries is that the value creation from switching to nightly deliveries is insufficient or highly uncertain for many stakeholders compared to the incurred costs, or the value is captured unevenly between the stakeholders. Furthermore, many of the stakeholders that would be able to achieve increased savings from nightly deliveries have been unable to provide their customers with a beneficial value proposition in regard to off-peak deliveries; hence they have been unable to convince their customers to switch to off-peak deliveries. This conclusion can be made based on other off-peak trials, where the financial incentives in the form of savings have not been enough to motivate a shift to off-peak hours. It took a massive increase in traffic during the Olympics to motivate businesses and freight operators in London to change to nightly deliveries. Several reports from the trials in New York imply that there should be enough financial incentives to motivate a shift to off-peak deliveries, and that it constitutes a market failure that there are not more nightly deliveries taking place; instead the city of New York had to create a grant scheme to convince companies to implement off-peak deliveries (Holguín-Veras, et al., 2014) (Holguín-Veras, 2007), which is reviewed further in section 4.1.

When studying supply chains, it is not uncommon to use theories from other disciplines in order to explain the phenomenon in question (Chicksand, et al., 2012). The issue within the off-peak supply chain that is studied in this thesis has to do with value creation and value capturing; hence the issue will be studied from a business model perspective. The business models of the different stakeholders will determine the rate of success when investing in a new innovative way of operating the business. There are many changes at an operative level, but it is still the different components of the business models of the stakeholders that will explain how value is created and captured in regard to these changes.

3.2.1 Business Models

A business model describes how value is created and captured and how innovations and business opportunities are made profitable, thus making it a valuable framework for companies, which is generally accepted in the literature on business models (Carayannis, et al., 2014). During the last two decades there have been an increasing number of academic papers analyzing business models and its practice, however there are still disagreements on many levels over what a business model is. Theories regarding business models have developed within certain research areas and contain conceptual differences across these areas; one area being strategic issues, such as value creation, competitive advantage, and firm performance, which will be relevant for this thesis. On the other hand, there is still consensus regarding certain aspects such as the ability of business models to explain value creation and value capturing, and provide a general description of the way a firm does business on a system level. Business models consist of a value proposition, a revenue model and a network of relationships where the interaction between these different parts is an important aspect (Zott, et al., 2011).

According to Hacklin and Wallnöfer (2012), the performance of companies is highly affected by the business model since the structure behind value creation and value capturing is determined by the business model. Therefore, business model plays an important part in creating a
competitive advantage. Given the intense competition when it comes to logistics services, it creates pressure to evaluate business model aspects and transform the business away from a focus on minimizing costs and towards strategic factors that will create a more long-term value and competitive advantage (Chapman, et al., 2003).

Companies can analyze different elements of the business by using the business model as a cognitive framework, which facilitates the integration and organization of these elements. This provides a good foundation when venturing into new business opportunities. Business models also take external stakeholders into consideration, which means that it is a more efficient tool compared to more firm-centric concepts, thus it is suitable in regard to business opportunities within multi-actor systems (Hacklin & Wallnöfer, 2012).

### 3.2.2 Changes and Larger Transformations

According to Zott et al. (2011), when companies face systemic changes in the way of doing business, the business model is a useful framework for dealing with these changes. By transforming the business model and making it more effective, given the conditions and challenges that the company encounters, one can achieve a greater value creation and increased competitive advantage. Thus, companies are able to compete through business model innovation.

Even when faced with smaller changes, this can have a significant impact on the value creation and value capturing of a company; hence the company can turn to its business model to determine how the changes are compatible with the structures and processes of the business. For companies that are faced with lowered margins and high competition, which lowers prices and increases the cost-pressure, it can be very beneficial in the long run to assess the business model in regard to adaptability and innovation (Carayannis, et al., 2014). Adapting the business model, as described in “Reinventing Your Business Model” by Johnson et al. (2008), will enable new business opportunities to be fully captured. Thus, by identifying how the business model structure for each stakeholder within off-peak is useful when fulfilling the value proposition that the transportation solution contributes to, one can more easily distinguish which factors that are crucial to capturing the value that is created, and which changes that can increase the value creation and value capturing.

When transforming the business to become more sustainable, companies are often faced with a high level of uncertainty, hidden systemic effects and complex coordination within systems, which complicates the decision-making process, according to Sommer (2012). Gauthier and Gilomen (2016) argue that previous studies of sustainable transformations of supply chains have usually not paid enough attention to connections to other business model components. For example, there is not enough consideration of the company’s value proposition and revenue models. Furthermore, these sorts of changes are usually built on collaborations with many other stakeholders, which create a need for the research to focus on collective implementation and management and how this affects the value propositions of the stakeholders.

### 3.2.3 Business Model Components

When describing the different components of a business model, the literature often mentions value creation, value delivery and value capturing. Value creation explains how processes are carried out and resources are transformed into value for a specific customer, while value delivery describes how the value is delivered and to whom. Lastly, value capturing addresses cost management and revenue streams (Carayannis, et al., 2014). Dividing the business model into different components can be a useful analytical tool; each category can be studied in-depth.
while still analyzing how the different categories are inter-connected. This enables a holistic view and provides a framework for a comprehensive study.

Many scholars place their main focus on components consisting of value creation and value capturing (Hacklin & Wallnöfer, 2012), as displayed in Figure 3. When reviewing the literature on business models, Shafer et al. (2005) found 12 different definitions of business models and 42 different business model components. The authors argue for their own definition of a business model, which is based on the two components value creation and value capturing, with a value network as the surrounding context.

![Business model diagram](image)

*Figure 3. The focus of business models*

Value proposition is also an element that frequently appears in the literature on business models. According to Teece (2010), the elements that the business model describes are also what support the value proposition of the company. Tongur and Engwall (2014) define the components of a business model framework to consist of a value proposition, value creation and value capturing, while Johnson et al. (2008) divide the business model into four components: customer value proposition, profit formula, key resources and key processes. The value proposition describes how the offering is valuable to the customer, while the profit formula represents the value capturing. The last two components, key resources and key processes, describe how value is created.

For this thesis, the business model framework will be divided into three components: value creation, value proposition and value capturing, as represented in Figure 4. This is a simple yet comprehensive categorization of a business model that is also used frequently by other studies, which is why it will be used in this thesis when analyzing the implications of off-peak deliveries. When analyzing the empirical data, the value creation component will be divided into subcategories consisting of resources and processes in order to obtain more detailed knowledge regarding how value is created. The focus on resources and processes has been inspired by the article by Johnson et.al (2008). Since this article occurs frequently in other studies on business models and is applied to a general context, its categorization of a business model is considered to be suitable in regard to off-peak deliveries.

Many other business model frameworks are adapted to e-businesses according to Zott et al. (2011) and are therefore used in very different contexts compared to off-peak deliveries, making them less suitable for this thesis.
Figure 4. The three components of the business model framework

**Value Creation**
The value creation as generally described in business models consists of value created for both the company and its customer.

**Value Creating Resources**
People, relationships, technology, equipment, facilities and the channels that are needed to create value for the company and its customers fall under this category. Standard resources that have an insignificant impact on the value creation will not be considered in this category; only the resources that contribute to a competitive advantage are in focus (Johnson, et al., 2008). The resources fall into categories such as physical resources, intellectual resources such as brands and partnerships, human resources and financial resources (Osterwalder & Pigneur, 2010). When changing delivery methods, many key resources are affected or new ones may be needed.

The ownership of the resources will also affect how well value is created and delivered. Having control over key resources, for example by integrating more of the value chain, is an important factor when creating a competitive advantage (Richardson, 2008).

**Collaborative Value Creation Through Partnerships**
Many successful companies create partnerships with their customers in order to get a better understanding of the customer and to be able to create innovative support services that are in line with the identified customer need. Industries have become more customer-oriented and service-focused in order to achieve a greater competitive advantage, where the focus is on the entire value chain (Chapman, et al., 2003).

Complex relationships and interactions between multiple actors will be key factors when assuming a business model perspective on value creation. Many scholars focus on joint value creation, cooperation and partnerships when studying business models (Zott, et al., 2011), and it will also be an important unit of analysis in regard to off-peak deliveries since it is made up of a system of actors where the interactions are key to the value creation within the supply chain.

Partnerships can also contribute to value creation since they can be an efficient tool to identifying flawed routines and strategic blind spots, thus reducing risk and uncertainty and facilitating organizational learning, according to Sommer (2012). Rossi et al. (2013) argue that innovation capabilities often arise from inter-organizational partnerships, thus contributing to improved value creation, which in turn create a substantial competitive advantage.

**Value Creating Processes**
A company’s key processes are essential to a successful value creation and consist of both operational and managerial tasks such as development, manufacturing, sales, planning and service (Johnson, et al., 2008). Processes and activities within networks can also constitute key processes that contribute to the value proposition and the value capturing (Osterwalder & Pigneur, 2010).

In order for a business model to be executed effectively, especially in regard to business transformations, companies have to continuously look for new or adapted processes, according to Sommer (2012).

**Value Proposition**
The value proposition describes the value that is provided to the customer; Johnson et al. (2008) explain it as a company’s solution to the customer’s fundamental problem. In order to create a successful offering, the company has to understand the customer need and the
processes involved in fulfilling the customer need. According to Carayannis (2014), a convincing value proposition creates value for the customer but the value is targeted to specific segments and how it is presented and delivered will also impact the value of the offering.

**Service-Based Value Proposition**
According to Kindström (2010), there is a trend that companies are trying to transform their value proposition to focus less on products and more on services in order to achieve a competitive advantage. Adding more services is one way to increase the value being created, thus improving the value proposition. This can be very effective in industries with high competition, where decreasing margins and low-cost competitors pose a threat. With an increased focus on services, many companies experience a deeper customer interaction, which creates a relational dimension to the offering. The value of the offering can increase as a result of more customer input, increased trust and long-term partnerships, thus increasing the motivation for companies to change to a service-based value proposition.

**Value capturing**
The business model also explains how a company captures part of the value that is created. It describes both revenue streams as well as the cost management (Johnson, et al., 2008).

**Pricing Strategies**
The pricing method will have a large impact on the value that a company is able to capture for itself. Matthyssens et al. (2008) describe how an industry with a large focus on cost containment and a sales volume orientation will have difficulties in introducing new value concepts as joint operations between suppliers and customers since the supply chain relationships are more adversarial with mainly short-term perspectives. By changing pricing structures, as well as collaborative methods, new opportunities for value creation and value sharing could instead be made possible according to the authors.

In regard to service industries, for example the goods transportation industry, the pricing is based on parameters such as hourly billing or a fixed price per activity, whereas production companies usually base the pricing on unit sales. Service industries can also utilize more advanced pricing mechanisms such as a price based on the increased productivity that the service enables for the customer or other types of profit sharing methods (Kindström, 2010).

**Profit Sharing**
Being innovative in regard to pricing provides a company with many opportunities to capture more of the value for itself. Some sort of profit sharing mechanism is considered to be an innovative pricing method that is often suitable for service-based business models. In order to successfully use profit sharing methods, the supplier and the customer must have a clear view on what to measure and how it should be measured (Kindström, 2010). Cost-based pricing, uncertainty regarding the value creation and an uneven bargaining positions can create barriers and prevent a profit sharing scheme which in turn will lower the supplier's portion of the created value (Töytäri, et al., 2015).
4 Empirical Background

This chapter contains a review of off-peak trial in other cities in order to create a greater understanding of the issues that are studied. A presentation of the pilot project in Stockholm is also provided. The chapter is concluded with a description of the master thesis’ client company, Scania, and their interest in off-peak deliveries.

4.1 Previous Studies of Off-Peak Deliveries

Off-peak deliveries constitute a change within the supply chain that affects all of the stakeholders in different ways. It is also an eco-efficient initiative, which increases the sustainability of goods distribution. In many European cities, the delivery method has been made possible due to changed regulations regarding driving heavy haulage at night, which is otherwise banned in many cities. The lifted regulation is usually replaced with requirements regarding noise level or routes taken, which means that the carriers, shippers and receivers have to adapt their operations to the new requirements as well as the fact that the operations take place during the night.

Off-peak deliveries are usually conducted with assisted goods reception, meaning that personnel are present to receive the goods, or with unassisted goods reception, which implies that the carrier has access to a storage area and unloads the goods without any of the receiver’s personnel being present.

Many cities have in general found it difficult to establish off-peak deliveries at a wider scale, due to the added staff costs that are imposed on the receivers that do not have unassisted delivery zones. Instead, many receivers have to extend personnel hours in order to receive the goods during off-peak hours, which often implies that there is also an increased salary cost because the staff is working during unsocial hours. There has also been a resistance to making larger changes to the logistical structure, for example implementing unassisted goods reception, since there is still a high level of uncertainty regarding the benefits of off-peak deliveries (Holguín-Veras, et al., 2014). Without knowing that investments will eventually become profitable, the receivers are unwilling to make any investments. Without the receivers on board, many trial runs have failed to establish off-peak deliveries as a viable transport solution (Holguín-Veras & Aros-Vera, 2015). However, New York City has managed to extend off-peak deliveries beyond the pilot stage by creating more incentives for the receivers (Holguín-Veras & Aros-Vera, 2015). Since two trial periods have been concluded, over 400 businesses have started to use nightly deliveries, to some extent (Holguín-Veras, et al., 2013).

According to Holguín-Veras (2007), the interactions between the receiver and the carrier have a large impact on the likelihood of switching to off-peak deliveries. Several studies have concluded that the receivers, and to some extent the shipper, usually have more influence over delivery decisions compared to the carrier (Georén, 2015) (Holguín-Veras & Silas, 2012) (Holguín-Veras, et al., 2014).

4.1.1 New York

In New York, there has not been any strict restriction regarding noise levels and deliveries have been allowed to take place during the night. In order to increase the rate of nightly deliveries, a shorter pilot project was initiated to encourage more carriers, shippers and receivers to move goods distribution to off-peak hours. The first pilot phase ended in 2010 and a later implementation phase was introduced in June of 2011 (Holguín-Veras, et al., 2013). The first pilot project included 25 receivers and 8 carriers that shifted to off-peak deliveries during one month (Holguín-Veras, et al., 2013).
In New York City, the main obstacle when implementing off-peak deliveries has been the added costs for the receivers, therefore they have generally been unwilling to make this change. According to Holguín-Veras et al. (2008), as much as 95% of the deliveries in the city take place during regular hours which makes it clear that there is a need to emphasize the incentives of nightly deliveries for the receivers.

The urban delivery industry is highly competitive with prices usually set at the marginal cost. Daytime tolls in New York has been viewed as an incentive to switch to off-peak deliveries but it has failed to garner further motivation to change the delivery times to off-peak hours. Studies have shown that the carriers are unable to transfer the cost of the daytime tolls to the receivers; hence the incentive to switch to off-peak deliveries remains with the carrier. Given the dominance of the receiver in regard to delivery decisions, the daytime tolls are not an effective tool to direct deliveries away from peak-hours (Holguín-Veras, 2007). For as little as 9% of the operations, the carriers managed to transfer the cost to the receivers, and the cost of daytime tolls is generally a lot lower than the cost for the receivers to adjust to supplies during off-peak hours (Holguín-Veras & Aros-Vera, 2015).

During the pilot run in New York, the receivers were given financial compensation to cover the increased costs of adjusting their operations to off-peak deliveries, in order to motivate them to participate in the project. The compensation was financed with the help of the daytime tolls and it was concluded that the subsidies were an effective incentive as the willingness to participate increased (Holguín-Veras, 2007). Consequently, when the trial runs ended and subsidies were no longer administered, the participants that used staffed goods reception switched back to daily deliveries since the cost of keeping the staff during off-peak hours was too high without the subsidies. However, most of the participants that used unassisted goods reception continued to use off-peak deliveries, since these goods receivers did not experience any added personal costs with nightly deliveries. They experienced mainly benefits such as a superior delivery reliability, which meant that they could decrease safety inventory levels. Having the deliveries in place when the business day started made it possible to identify delivery errors earlier on, which left more time to correct the order and resulted in fewer operational disruptions (Holguín-Veras & Aros-Vera, 2015).

However, the unassisted deliveries require a higher level of trust between the carrier and the receiver since it often involves the receiver handing over keys to the facility or part of the facility. Unassisted deliveries are usually preferred when the carrier, shipper and receiver are a part of the same parent company or a related company, or when the receiver has a stronger partnership with the carrier. Otherwise, more modifications of the storage facility might be needed in order to only give the driver access to a small part of the facility. Furthermore, the number of receivers that are able to use assisted deliveries is far greater than those that are willing to switch to unassisted deliveries, according to Holguín-Veras et al. (2014).

Studies have shown that with an integrated carrier-receiver operation, the incentives created by off-peak deliveries become more effective since all of the stakeholders can take advantage of the benefits. For independent operations, certain incentives only impact one stakeholder and do not provide benefits to the system as a whole. Therefore, off-peak deliveries are more likely to be accepted by integrated operations (Holguín-Veras, 2007).

Many studies of off-peak in New York have focused on the carrier being able to provide the receivers with a discount for deliveries during off-peak hours since delivering during the night could provide the carrier with a lot of savings, such as delivering more volume during fewer hours and increasing the utilization of the truck. However, due to the low margins of the carriers and because the current delivery volumes during off-peak hours are too small to produce enough profits, they cannot afford to discount the prices at this stage, which also
hinders the delivery volumes during off-peak hours to increase, thus constituting a vicious cycle (Holguin-Veras, et al., 2014).

## 4.1.2 London

In London, road transportation is used to deliver more than 90% of all freight, hence goods deliveries contribute heavily to the congestion in the city (Transport for London, u.d.). Several studies show that the almost half of all urban deliveries in the UK are conducted during the hours of 06:00-12:00, and the majority of these deliveries coincide with the heaviest morning congestion period. For example, food retailers usually receive their deliveries in the morning hours before 09:00 (Cherrett, et al., 2012). In London, 25% of the traffic during 07:00-11:00 consist of freight vehicles (Transport for London, u.d.).

Like Stockholm, urban areas in England also have restrictions regarding heavy goods vehicles during nighttime due to the noise levels of the deliveries. However, there has been a relaxation of these restrictions to allow for trials to be conducted that evaluate the benefits of nightly deliveries and assess noise levels and noise reduction methods. In 2009, a scheme to test quiet deliveries was established and the trials started in 2010 at five different retail locations across England. The trials were deemed successful even though there were only marginal improvements regarding delivery times and fuel consumption. Instead, the main focus of the trial was to manage the increased noise levels. A contributing factor to the perceived success rate of the project was the well-functioning partnerships and cooperation between companies and local government (Douglas, 2011).

A new off-peak trial was initiated in London before the Olympics 2012, due to the heavy daytime traffic that the Olympic games would contribute to. Before the trial, only 3% of the businesses were already taking part in nightly deliveries but during the Games, 15-20% of the businesses and about a third of the freight operators had shifted to off-peak deliveries (Transport for London, 2012) (Transport for London, 2013). Over 50% of the participants reported that they did not experiencing increased costs when changing delivery hours, while 38% of businesses and 32% of freight operators said to have experienced cost increases (Transport for London, 2013). This meant that a substantial portion of freight vehicles shifted to off-peak hours and resulted in an adequate accessibility of the road networks during the Olympics (Transport for London, 2012).

After the Olympics, only 5% of the businesses and 3% of the freight operators that had changed to nightly deliveries continued to deliver goods during off-peak hours according to Transport for London (2013). The report “Travel in London” by Transport for London (2012) found that about 25% of the freight operators that had switched to off-peak deliveries or increased the deliveries intended to keep delivering goods during off-peak hours after the Olympic games. According to Transport for London (2013), the key factors that motivate a use of off-peak deliveries are stated as followed:

- There is less congestion during these hours (main reason),
- The business is already a 24-hours operation,
- Customer requirements demand off-peak deliveries,
- To a small extent, cost benefits (cheaper deliveries).

## 4.1.3 Los Angeles

As a result of the substantial growth in container traffic between 2000 and 2004 at the ports of Los Angeles and Long Beach, a program was initiated in 2005 to reduce truck traffic and pollution by shifting more of the traffic to off-peak hours. During peak hours (Monday until
Friday, 03:00-18:00) the carriers have to pay a fee when accessing a terminal, thus creating incentives to move operations to off-peak hours (PierPass, 2016). The fee is used to finance the added labor and operational costs that incur when shifting to off-peak operations.

More than 30% of the container cargo has since been shifted to off-peak hours (Holguín-Veras, 2007) (LaBelle, 2015). The success of the program can be mainly contributed to the design of the fee. Since the fee is paid per 20 or 40 feet container, it is charged directly to the shipper instead of the carrier. Hence, the program is able to create incentives to switch to off-peak deliveries for the key decision maker, in this case the shipper, which creates an efficient control measure. The fee is relatively high which has also contributed to the success rate of the program (Holguín-Veras, 2007).

### 4.1.4 Denmark

In Denmark, an off-peak trial project was initiated in 2012, where off-peak deliveries were introduced and evaluated in the country’s four biggest cities. The results show a significant potential for higher efficiency, both from a financial and environmental perspective, as well as an increased quality of deliveries. The project identified benefits in terms of time savings, better utilization of material (trucks) and fuel savings. (Trafikstyrelsen, 2014)

The project found some challenges with off-peak deliveries, such as sub-optimized delivery routes when only a small portion of receivers agreed to accept off-peak deliveries. Certain stores are banned from nighttime deliveries because of risks to disturb nearby residents, which adds to the problem of increasing volume of off-peak deliveries. They also identified some complications with receivers that do not have staff present at the time of delivery, which needs to be solved with carrier access to the receiver’s facilities. However, this solution generally requires high levels of trust between receiver and carrier. (Trafikstyrelsen, 2014)

Another conclusion from the project was that some sort of political instrument might be needed to create enough incentives for companies to invest in new technologies that enable off-peak deliveries, as there are risks involved with such investments. (Trafikstyrelsen, 2014)

### 4.2 The Pilot Project in Stockholm

In Stockholm, there are restrictions regarding heavy haulage during the night due to noise pollution caused by the vehicles and the unloading of goods. After 10 pm and before 6 am it is prohibited to drive heavy haulage (over 3,5 tons) in the inner city of Stockholm (Traffic administration, City of Stockholm, 2012). The City of Stockholm has initiated a project with the purpose of evaluating the benefits of allowing trucks to deliver goods during off-peak hours. The project is a collaboration that also includes Svebol Logistics AB, Lidl Sverige KB, Martin & Servera, Scania CV AB, AB Volvo, the Royal Institute of Technology and Chalmers. The Royal Institute of Technology acts as a coordinator of the project. The field trials started in 2014 and will continue throughout 2016 with two trucks delivering goods to three Lidl supermarkets and a limited number of restaurants and hotels.

The project started in mid-2014 with nightly deliveries to the three Lidl stores. In mid-2015, a gas truck was added to deliver goods during off-peak hours to approximately 10 restaurants and hotels that are customers of Martin & Servera (Georén, 2014).

The City of Stockholm expressed a requirement of the trucks in the pilot project to be classified as clean trucks when giving the exemption to deliver goods at night. By formulating the regulations to only permit clean trucks during off-peak hours, the project could contribute even more to an increased sustainability in the transport sector. The expressed aim is to include such
a requirement if the regulations are changed in the future and a general permit to drive heavy haulage during off-peak hours in central Stockholm is created.

One gas truck from Scania and one hybrid truck from Volvo have been chosen for the pilot project since these trucks fulfill the preliminary requirements. The trucks and the loading equipment that are used in the project have been developed to keep the noise level to a minimum, which is also part of the requirements. Transport efficiency, the working environment and noise levels will be measured continuously during the project period (Georén, 2014). By the end of 2016, the project will be evaluated before any decision is made whether the off-peak trials will continue and be expanded to include more participants. It has yet to be determined what the technical requirements would look like if the city of Stockholm decides to extend the off-peak delivery exemption. Any limitation to which routes in the city that will be allowed has also not been determined (Brolinson & Skogens, 2016).

However, the general view of the Traffic Administration in the City of Stockholm is that a scheme that includes subsidies will not be relevant for Stockholm. Instead, they hope that the stakeholders can create enough benefits from off-peak deliveries to make subsidies redundant. Therefore, it is even more important to study the value creation and value capturing of off-peak deliveries in Stockholm since it is very likely that subsidies will never be introduced.

### 4.3 Client Company

The master thesis is conducted on behalf of the commercial vehicle manufacturer, Scania. Scania has approximately 42 000 employees spread across 100 countries, with the head office in Södertälje, Sweden. Scania receives its revenues mainly from vehicles and engines, repairs and maintenance, financing and insurances, and used vehicles. Scania aims to increase its customers’ revenues by providing them with flexible solutions with high capacity, while lowering costs for the customers, such as fuel costs. Scania also places a lot of value in understanding the entire supply chain, which means that an understanding of the carriers’ customers is something that Scania strives for as well. By understanding the need of the companies that purchase the services of Scania’s customers, Scania is able provide its customers with solutions that create value further down in the supply chain (Scania, 2015).

Consequently, Scania has an interest in off-peak deliveries and how this transport solution can be profitable for all of the stakeholders. With an increased understanding of the dynamics within off-peak deliveries, Scania can improve its value proposition to its customers in regard to the new transport solution.

Scania’s current business model is still based on selling high quality products and services to its customers that increase the profitability of the customers. Scania aims to build partnerships with its customers and the customers’ customer, although the majority of the customer relationships are, as of today, of a transactional nature (Bäck & Lewenhaupt, 2015).

Scania has supplied a gas truck to be used for off-peak deliveries in Stockholm. The gas truck is PIEK certified which means that the noise level from the truck must be lower than 72 dB (A) at a distance of 7,5 meters from the truck. Compared to a normal diesel truck, this kind of vehicle is considerably quieter. A regular diesel truck produces noise almost twice of the PIEK level (Scania, 2015).
5 Empirical Study

In this chapter the empirical results are presented and analyzed in regard to the theoretical framework. The results fall under three categories: value creation, value proposition and value capturing. The empirical results are based on interviews with the stakeholders within the off-peak project and separated into two cases. Case 1 includes the carrier and the grocery chain while case 2 includes the same carrier but also a wholesaler that has the role of shipper and the receivers that constitute a group of restaurants and hotels.

5.1 Value Creation from Off-Peak Deliveries

The main value created from off-peak deliveries consists of increased transport efficiency for the deliveries, increased utilization of the trucks, increased quality, and to some extent an improved market positioning. A wide range of activities and resources has a large impact on the value creation. The two cases have different set-ups regarding processes and resources; hence the extent of the value creation within the two cases differ. Firstly, the route design is quite different in the two cases, where the truck delivering to the grocery stores drives longer distances back and forth from the storage facility, while the wholesaler distributes goods with only one or two truckloads, as seen in Figure 5 and Figure 6. The following sections describe how value is created and how it differs between the cases.

![Figure 5. The flow of deliveries to the grocery stores](image)
5.1.1 Value Creation from Increased Transport Efficiency

The transport efficiency referred to in this section constitutes improvements that have a direct impact on off-peak deliveries. In this case, it is the fact that the trucks are used more efficiently during off-peak deliveries, which is one of the greatest quantifiable values since it results in lowered delivery costs because fewer hours of truck usage are needed in total. Three factors are the main contributors to the efficiency gain: faster deliveries due to less traffic, better access to loading zones and more dispersed deliveries, i.e. being able to ensure that the customers have access to the goods at the start of the business day while still delivering the goods during a large time period during the night which enables a more efficient usage of the trucks.

Faster Deliveries per Driving Distance

Faster deliveries due to less traffic congestions result in fewer hours of truck usage for the same amount of deliveries or being able to reach more receivers during the same shift. The time gain has not been exactly determined within the Stockholm project. The report "The Efficiency of Off-peak Deliveries in Stockholm City" by Li (2015) estimates the time gain of the deliveries to the grocery stores to be at least 21 % and probably more in many instances. The time gain is valuable since it results in a reduced cost per delivered unit.

Case 1 – The Grocery Chain

The delivery time to the three grocery stores is highly affected by the reduced traffic during off-peak hours. According to the head of logistics at the grocery chain, the increased efficiency that the faster deliveries contribute to enables them to distribute the same volumes of goods but with lower costs. They estimate that they save about two hours per 12-hour-shift from the increased speed of driving at night. When compared to extreme traffic situations with heavy congestion, the estimation is that the time gain can be up to five hours. However, these time gain estimations have not been properly measured or verified.
Case 2 – The Shipper and Receivers

For the second case, the driving time per kilometer is also perceived to be improved but there is no comparative data for the driving speed when taking the same route during daytime traffic. The carrier and the shipper estimate that there is a time gain, given that the traffic is much lighter during off-peak hours, yet it has not been quantified. Therefore, it is not possible to put a lot of emphasis on the value created from increased driving speed in case 2. According to the head of transport at the shipper, the time gain is largely counteracted by two factors, described below, which means that the value of increased speed of driving at night is not as substantial as in case 1.

One factor that counteracts the time gain slightly is the longer route taken during the night. One of the receivers that used to operate in the inner city of Stockholm moved its operation to a suburb outside of Stockholm, which has extended the driving distance and somewhat counteracts the time gain from the improved driving speed. However, according to the carrier, the distance between the stops is on average not much longer than the daily routes. Some of the afternoon routes are even more spread out while the morning routes usually have shorter average distances compared to the off-peak route.

It also takes longer to unload the trucks when delivering during off-peak hours, which is the second factor that counteracts the time gain. Firstly, slightly more time is spent on unloading because the driver needs to be more careful when unloading to keep the noise level down. Secondly, the driver often needs to carry the goods farther and place the goods correctly in the storage facility with regards to chilled, frozen or dry food. This increased level of service from the driver occurs much more frequently during off-peak deliveries, compared to daily deliveries. The extra activities take more time and according to the head of transport at the wholesaler, this erases a lot of the time gain attained from the increased driving speed and it is difficult to estimate how much of an impact the time gain has on the overall performance of off-peak deliveries.

More Dispersed Deliveries

Having to reach many receivers during a short time period usually leads to more trucks being needed which reduces the filling degree. To counteract this, the routes can be designed to include stops with more dispersed delivery times in order to increase the utilization of the truck, but the tradeoff is usually longer routes. Off-peak deliveries create a larger delivery window, which can improve both the filling degree as well as the routes taken.

Although, it is not necessarily the nightly delivery period that enables this according to the owner of the carrier; several companies are already able to keep a high filling degree of the trucks and plan the routes more efficiently by spreading out the deliveries during the day. It is the conditions and requirements of the customer’s business that is the determining factor if a high filling degree and efficient routes can be achieved. As previously mentioned, many receivers of groceries prefer to have access to the goods in the beginning of the business day, often before 9 in the morning. For many of the receivers in both cases, the work intensifies gradually during the day and after a certain time period it becomes very stressful to also take care of deliveries. Some receivers also need to have access to the supplies before a certain time in order to have time to plan the rest of the business day. This creates a smaller window of time for the deliveries and often results in more trucks being needed in order to reach all of the customers within the given time span, which results in a lower filling degree. Under these conditions, off-peak deliveries create a larger window of time for the distribution, which improves the filling rate of the trucks, while still ensuring that the customers have access to the goods when the business day starts.
Case 1 – The Grocery Chain
Before off-peak deliveries were allowed to the three grocery stores, three different trucks were used when delivering goods, in order to ensure that all of the stores would get supplies around 7 in the morning. In order to improve the utilization of the trucks, they used to deliver goods in other cities more than 10 miles away from Stockholm, before delivering to the inner city stores in Stockholm, which meant that the route design was far from optimal.

When using off-peak deliveries, the grocery chain only uses one truck for the three inner city stores, since the truck is used during the entire night shift. The other deliveries that were made when using three trucks still remain but the logistics have improved drastically with much shorter routes and a large time span for completing the deliveries, which in the end means that fewer trucks are needed to carry out deliveries. This is one of the greatest benefits of off-peak deliveries for the grocery chain.

Case 2 – The Shipper and Receivers
For the shipper, one truck has been moved from daily deliveries to nightly deliveries, which means that the same number of trucks is still being used in the regular fleet. Before using nightly deliveries, they were sometimes forced to request extra trucks in order to deliver all the goods during the required delivery period in the morning, according to the head of transport at the shipper. When implementing off-peak deliveries, they mainly moved the deliveries of their larger customers to off-peak hours, which provided some relief to the daily routes since a large quantity of these deliveries could be spread out during the night instead of being delivered during a short time period in the morning. This also reduced the need for extra trucks during the morning and created enough free capacity to increase the delivered volume during the morning hours. However, it is unclear to what extent the use of extra trucks has decreased and the financial impact that this has on the business. According to the head of transport at the shipper, off-peak deliveries constitute a long-term investment and there are not any clear savings for them as of now.

The conditions regarding the flexibility of the nightly delivery times are also different in case 2, compared to case 1. Many of the receivers in case 2 use assisted deliveries during off-peak hours, which means that they are less flexible regarding delivery times, thus decreasing the delivery time span. Some of the receivers use unassisted deliveries but do not give the driver access to the chilled storage facility due to safety reasons; instead the goods are placed in room temperature. Therefore, the operation relies on delivering the goods closer to the start of the business day, allowing the receivers to take care of the goods within a short time span, thus making sure that the goods are not affected by being in room temperature. This also decreases the flexibility and length of the delivery period.

Overall, nightly deliveries still have a positive impact on the ability to disperse the deliveries. By moving deliveries to off-peak hours and freeing up capacity during the morning deliveries, even the reliability of the daily deliveries has improved slightly. The ability to add a few new deliveries to the morning routes due to this extra capacity is also valuable according to the shipper. The more dispersed deliveries give the shipper the possibility to complete more deliveries while using the same number of trucks, thus the same costs. The head of transport at the shipper believe that they would be able to decrease the number of trucks used if the volume of delivered goods during off-peak hours were to increase. Given that only a smaller number of receivers have agreed to off-peak deliveries, the positive effects regarding the delivery efficiency do not have a substantial impact, as of today.
**Better Access To Loading Zones**

The deliveries are also more efficient because of the elimination of unnecessary routes that occur when the driver is unable to deliver the goods because the loading area is occupied. When operating during the daytime, other businesses also receive deliveries and it is not uncommon that the loading dock is occupied with other trucks making deliveries to nearby companies. In these instances, the driver has to either circle the block until the loading area becomes available or continue the delivery route and return to the occupied slot later on when it might be available again, which is very time consuming and reduces the number of stops that can be made per truck and hour. In some instances, the driver parks illegally which increases the number of parking tickets that the carrier receives. In the inner city there is generally not enough loading docks and many of them are shared by several businesses, but during off-peak hours there is not any competing traffic at the loading zones which results in an elimination of extra routes. There is, however, an increased risk that cars are blocking the loading zones during the night, but the overall availability is increased. Due to the reduced traffic at night, the truck is also less likely to block other drivers when parking in the street at night.

**Case 1 – The Grocery Chain**

This does not create more value in the case of the grocery chain since it has its own allocated loading zones for most stores.

**Case 2 – The Shipper and Receivers**

When delivering to smaller businesses, as in this case, the increased availability of loading areas during off-peak hours creates a lot of value within the supply chain. Many of the receivers in this case do not have their own loading zone; hence the routes become more efficient with off-peak deliveries, which increases the overall efficiency of the deliveries. The pricing method of the carrier towards the shipper will determine who profits the most from this efficiency, which is discussed further in the analysis in section 5.3.1.

**5.1.2 Value Creation from Increased Quality**

Off-peak deliveries do not only contribute to value creation in the form of increased efficiency, but also increases the quality of the deliveries.

**Improved Reliability of Deliveries**

Another observed value creation from off-peak deliveries is the improved reliability of the deliveries. There are two ways of defining reliability for the customers. Either the customers need to receive the deliveries before a specific time in the morning, which means that the reliability is improved with off-peak deliveries since the goods are always in place in the morning when delivered during the night, or the customers need to receive the goods at a specific time, which means that the reliability is improved because of a decreased variance of the driving speed due to less traffic.

For both cases that were studied, value is created for the carrier because of the increased reliability of deliveries. Decreased variance when making deliveries will make it easier for the carrier to complete all of the deliveries within the contracted time period. This is not just connected to the fact that there is an increased driving speed per kilometer. When contracts are drawn up, the general driving speed is taken into account when determining the amount of stops that can be completed within a certain time span. However, during peak-hours, there is a higher risk that the deliveries are not completed in time because the level of congestion can vary a lot. This results in overtime payments for the remaining time that it takes to deliver the goods. During off-peak hours the variance of the driving speed is very low (Li, 2015), which implies that the delivery schedule is easier to complete on time.
By reducing delays, the receivers also have more time to correct delivery errors such as missing products or incorrect products, which is valuable for the stakeholders of both cases since it improves the quality of deliveries and reduces obstacles for the regular business of the receivers. However, this is also difficult to quantify in terms of savings and costs.

**Case 1 – The Grocery Chain**

For the grocery chain, the main value from more reliable deliveries is derived from always having access to the goods in the beginning of the business day, which enables a more efficient sorting of the goods. Before off-peak deliveries were introduced in the inner city, the stores needed more personnel available during a longer period of time in the morning since they did not know when the goods would arrive and how much time they would have to sort the goods. The grocery stores do not use large interim storage areas for the goods; instead the aim is to store as much as possible on the shelves, to a higher extent than other grocery stores. Therefore, it is a high priority to stock the shelves with new deliveries as soon as the business day starts, since many shelves are empty or almost empty from the previous business day. Furthermore, the grocery stores receive large volumes of goods every day, which means that they need several employees present to handle the deliveries. With off-peak deliveries they can reduce the number of employees that handle deliveries, and the number of hours assigned towards this, since they know more precisely when this assignment can start and how long it will take.

The ability to deliver at a more exact time is also valuable to the grocery chain since the store that receives the first delivery during the night uses assisted goods reception, which creates a need to match the delivery time with the schedule of the employees. It is also important that the deliveries arrive before the store closes. If the deliveries arrive later than that, the store will have to pay overtime to the employees.

While the increased efficiency of the deliveries results in larger savings for the grocery chain, the increased reliability is a great improvement of quality since it contributes to ensuring that the customers have access to the goods when the store is open. If the distribution of goods is delayed, it increases the risk of running out of certain items in the store. This can become costly in the long run, given that a lower quality of service can result in fewer customers.

**Case 2 – The Shipper and Receivers**

For the second case, the reliability of deliveries is also very important and creates a lot of value within the supply chain, especially for the goods receivers. How important it is to ensure access to the deliveries before a certain time or how important it is to be able to deliver at a more specific time varies depending on the arrangement at the receivers and their business operation. Some of the customers have assisted deliveries, which in general make it more important to deliver at a more specific time, at least during the time span where the employees are actually present. Some have both assisted deliveries as well as business operations taking place during the night, which increase the importance of being able to receive the goods at a specific time to ensure that the business is not obstructed by early or late deliveries. Only for a few of the receivers within this case, off-peak deliveries have contributed to fewer personnel hours needed to handle the deliveries of goods. Since the receivers know when they will have access to the deliveries, it is easier to schedule personnel to sort the goods and reducing the time needed as a safety margin.

In this case, the improved accessibility to loading zones also improves the reliability since the deliveries are not delayed because of occupied loading zones.

According to the head of transport at the shipper, the increased reliability is the most valuable aspect of off-peak deliveries since it greatly improves customer satisfaction, which is how the
shipper keeps its customers and reinforces its brand – resulting in increased sales in the long run.

However, the delivery method is not without fault. There have been instances when the deliveries arrive too early when the personnel responsible for receiving the goods are occupied with the regular business activities, which causes disruptions for the receivers. Although, these sorts of errors have been reduced over time as the stakeholders have improved their routines regarding the delivery change.

**Different Working Environment for the Drivers**

Working night shifts is generally believed to have negative health effects for the employees, which is why it is difficult to state that off-peak deliveries contribute to improved working conditions. But according to the owner of the carrier, the drivers that do not mind working night shifts perceive off-peak deliveries as a way to improve their working environment, which can be seen as an improved quality aspect surrounding the deliveries. Since the variation in driving time is reduced, due to less traffic at night, it is much easier for the drivers to deliver all of the goods in line with the schedule, which lowers the stress level for the drivers. They have also experienced that the reduced traffic contributes to fewer traffic accidents, which both improves the working conditions for the drivers as well as slightly lowers the cost of repairs for the carrier. The improved working environment is a high priority for the carrier even though the value is not always easily quantified. The owner of the carrier believes that those drivers that can accept night shifts obtain clearly improved working conditions and that this leads to fewer registered cases of sick leave, which would imply lower costs. However, the sick leave rates have not been quantified and given that night shifts are considered to have negative health effects in the long run, it is difficult to validate this claim.

There are other implications of the different working conditions during off-peak deliveries. The performance of the drivers usually has a rather large impact on the profitability of the carrier company since the work pace of the drivers will affect the ability to complete the deliveries on time. If the drivers do not finish the deliveries on schedule, it is the carrier that has to assume the costs for the extra time needed to complete the deliveries. However, unpaid delivery hours can be avoided to a greater extent during off-peak deliveries since it is easier to complete the deliveries on time when there is less variance in driving speed. Therefore, the work pace of the driver will have less impact on the profitability of the carrier, which means that there will be a higher level of acceptance regarding the individual work pace of the employees. According to the owner of the carrier, the daily deliveries puts a higher pressure on the drivers to have a high work pace, which means that off-peak deliveries could lead to a lower turnover rate. This is also something that has not been substantiated with any data, which means that it is more speculative and based on the experience of the owner of the carrier.

**Case 1 – The Grocery Chain**

In the case of the grocery chain, off-peak deliveries greatly improve the working conditions of the drivers provided that the drivers can manage working night shifts. Even if night shifts are not preferred by some drivers, the improvement of the working conditions during off-peak hours can still outweigh the negative aspects of night shifts. When delivering goods during off-peak hours to the grocery chain, the night shifts starts before 10 pm, and covers the entire night which enables the driver to have a twenty-four hours rhythm, albeit working during the night.

**Case 2 – The Shipper and Receivers**

In the case of the carrier delivering goods for the shipper, off-peak deliveries still create many of the positive aspects mentioned above regarding the working conditions. However, due to the starting time of the work shift, the negative aspects of working during unsocial hours increase.
The shift starts at 3 in the morning, which means that the shift is neither purely a night shift nor a morning shift. According to the head of transport at the shipper, this has created some difficulties for the drivers when trying to create a daily routine that works. Therefore, it becomes more difficult to find drivers that can work such an odd shift.

5.1.3 Value Creation from Improved Utilization of the Trucks

Improved utilization of the trucks also constitutes increased transport efficiency but is placed in its own category since it does not have a direct impact on the efficiency of the deliveries in question; instead it affects the overall logistical operations of the stakeholders. In these two cases, the utilization of the trucks can be improved by using the trucks both during the night shift and the day shift. This can result in a need for a smaller truck fleet, which will greatly favor cost management. There are other financial values as well; the cost of the truck will be spread out over more hours when increasing the utilization of the day, since the cost per day from depreciation of the truck remains the same. Either it gives the carrier increased earnings per day from the truck or it gives the shipper a lower price per shift, since the cost of the truck is distributed over more hours of usage. Other costs, such as the salary cost of the driver, are of course added when increasing the utilization. There is also more wear and tear per day, which means that the truck will need service more often and the life span of the truck will likely be shortened, but according to Löfstrand et al. (2015) and Williamsson (2016) the increased earnings outweigh these extra costs from wear and tear. The value capturing of the increased utilization is discussed further in section 5.3.

Case 1 – The Grocery Chain

The hybrid truck is only used during the night; therefore there is no increased utilization that creates value for any of the stakeholders. The reason why it is not used during the night is not connected to off-peak deliveries, instead it has to do with the general logistical planning of the carrier and the grocery chain.

Case 2 – The Shipper and Receivers

Besides the night shift, the gas truck is also used during a short morning shift as well as an afternoon shift, which means that the utilization is at a high level and the stakeholders do not have to add a new truck for the daytime shifts. The head of transport at the wholesaler implied that it could be utilized even further but since the night shift ends rather late, they are not able to use it for a regular morning shift. By using the truck more, the cost per hour is decreased.

5.1.4 Value Creation from Improved Market Positioning

A value that is significant for the stakeholders, but not easily quantified, is the market position that off-peak deliveries contribute to. According to the owner of the carrier, this is the aspect that creates the most value for the carrier as well as its customers. The value of a positive market positioning is created from the different beneficial qualities of off-peak deliveries; it is a solution that greatly improves both the efficiency and quality of the deliveries and it places the companies at the frontier of technological and sustainable development of urban deliveries, in comparison to the competition.

An important aspect for both cases is that the stakeholders within the off-peak project are so-called first-movers in regard to off-peak deliveries in Stockholm. The value that is created when switching to nightly deliveries results in an improved offering to the customers and these stakeholders are the first companies on the market to offer this new solution, thus improving the market positioning even further.
By contributing to increased sustainability, the branding is also improved for the companies. The project has received some media attention because of its focus on more environmentally friendly technology, which benefits the different stakeholders within the project. Several of the stakeholders have also been visible in industry press due to off-peak deliveries.

For the carrier it is very important to have this position, in regard to both the studied cases. According to the owner of the carrier, they continuously make investments in new technology in order to improve the offering to the customer, which positions them as a strong business partner and this is their way of competing on the market. It was stated that being able to offer a solution such as off-peak deliveries earns the company new business opportunities and increased sales.

However, it is extremely difficult to quantify the value from the improved market positioning. Therefore, the incentive that it creates is not as strong as the potential savings that are achieved from increased efficiency. The value of an increased market positioning is also more indirect as it will eventually affect the sales volumes in a positive way, whereas the value from the increased reliability has a direct impact on the receivers since it has an immediate effect on their operations.

The Exception Provided by the City of Stockholm
A key factor that strengthens the market positioning even further is the conditions of the pilot project. As previously mentioned, the format of a research project provides more opportunities to garner media attention, but another factor that has a great impact is the exception provided by the City of Stockholm that allows the participants in the project to drive heavy haulage in the inner city during nighttime. This means that the stakeholders within the project have exclusivity in offering off-peak deliveries, which naturally creates possibilities of added sales. This also results in a lock-in effect; customers that prefer to receive goods during off-peak hours are required to stay with the only supplier that can provide these kinds of deliveries.

Regarding the exclusivity and the lock-in effect, the carrier is favored in both cases since they are the only ones that can provide off-peak deliveries to customers.

The negative effect of having an exception within the project is that it is more difficult to get invested in off-peak deliveries long-term since there is an uncertainty regarding the durability of the exception. It has yet to be determined if the exception will be extended after the project has ended and if a general exception will be introduced. The reluctance to invest completely in off-peak deliveries will hinder the development of new technology needed for the delivery method. The uncertainty surrounding it can also discourage customers from making necessary investments that are needed for off-peak deliveries.

Case 1 – The Grocery Chain
The grocery chain is affected more indirectly by the positive market positioning since off-peak deliveries are not a part of its offering to its customers. There is an indirect effect since the positive attention that the grocery chain receives from off-peak deliveries will improve its branding towards its customer. It became clear from the interviews that there is a great value in improving the general view of one's brand, which is why the grocery chain has invested further funds into promoting their participation in the project, such as striping the truck with its logo. The grocery chain does not have a lock-in effect since it does not offer off-peak but are, for now, locked to the carrier in order to continue to use off-peak deliveries for the three inner city stores.

The grocery chain is also receiving positive industry publicity, such as a logistics award, which indirectly can have an impact on marketing if industry acknowledgement reaches the
customers. At this point however, it is unclear to what extent this reaches the customers and very few measures are taken to actively promote this towards the customers. According to the head of logistics, it is most likely not widely known amongst the customers that the grocery chain is using more sustainable delivery methods. Nonetheless, this is an aspect that improves the company’s corporate social responsibility, which is also valuable.

**Case 2 – The Shipper and Receivers**

In the second case it is the wholesaler, in the role of shipper, that is affected directly by the improved market positioning since transporting goods is a part of their offering to the customers. The lock-in effect that off-peak provides during the project phase also has a very positive impact on the wholesaler, and it creates closer cooperation with the customers. The customers are dependent on the wholesaler if they want to keep receiving off-peak deliveries. Although, transportation is not a part of their core business since it is outsourced to carriers. Given that it is not a part of the core business, the effect on the market positioning can be considered to be less substantial compared to that of the carrier.

The wholesaler has produced marketing material in order to highlight their participation in sustainable solutions and get more receivers to choose off-peak deliveries. The head of transport at the wholesaler believes that it is still not widely known that off-peak deliveries have been initiated and the potential that it has. Instead, it seems to be more valuable for the wholesaler to inform the customers directly of this initiative as part of the sales process.

The receivers are also only indirectly affected by an improved market positioning, and to a much lesser extent than the grocery chain. From the interviews it seemed as if none of the receivers were actively using off-peak deliveries to promote themselves. Although, one receiver is a part of the shipper’s marketing material, which at least provides them with some attention within the industry.

**5.1.5 Value Creation from Specific Resources and Processes**

The underlying processes and resources of the companies are crucial when value is created. As a part of the empirical study, the resources and processes that changed when initiating off-peak deliveries were identified and their impact on value creation within the off-peak supply chain were assessed. The impact on the value creation from new resources and processes were also evaluated and already existing resources and processes that became crucial to off-peak were identified. The results are presented below.

**Value Creating Resources**

**Contracts**

Long-term contracts were already an existing resource between the carrier and its customers but the contracts became increasingly important when initiating off-peak deliveries since they made it possible for the carrier to make larger investments for its customers that were necessary to meet the requirement, thus making the contracts an indirect value-creating factor, as summarized in Figure 7. The contracts reduce the risk of larger investments since the carrier have secured its revenues by guaranteeing payment over a longer period of time from its customers. They also create more stable partnerships, which enables the carrier to focus on a higher level of customization. Customized deliveries and investments in new technology constitute both necessary requirements at this stage for off-peak deliveries as well as contributing factors for the value creation.
Figure 7. The effects of longer contracts

**Competence**

Off-peak deliveries create a need for greater capabilities regarding technology compared to normal deliveries and is an indirect factor in the value creation from off-peak, since it enables other direct value-creating factors. The carrier as well as both companies that have the role of shipper, i.e. the grocery chain and the wholesaler, mention the importance of technological competence. Off-peak deliveries in Stockholm require the use of both environmentally friendly technology and noise reducing technology which means that at least one actor within that part of the supply chain needs to understand the technology and be able to keep the costs down. In both cases this has mainly been the responsibility of the carrier, while of course all of the stakeholders are more or less active when it comes to implementation. The considerable expertise of the carrier is also one of the reasons the grocery chain agreed to sign a longer contract with the carrier; it was a crucial part of the value proposition from the carrier, according to the head of logistics at the grocery chain.

Nonetheless, the grocery chain has also obtained increased knowledge regarding quiet equipment, since they have had to make more investments into new technology compared to the shipper of case 2. The truck manufacturers also have to possess certain capabilities regarding the modifications of the trucks used for off-peak deliveries. Scania had already produced silent trucks for PIEK certification (a certification regarding maximum noise level), but since there are different regulations in different cities, it puts more pressure on the ability to produce quiet trucks.

**Value Creating Processes**

**Unloading of Goods**

Off-peak deliveries have led to a change in the process of unloading goods. In both cases, the drivers need to be more accurate when unloading the goods and it is more important where the goods are placed after unloading. Since many of the receivers use either unassisted deliveries or use personnel that are not accustomed to receiving goods, more responsibility has been transferred to the drivers regarding the placement of the goods; hence the actions of the driver have become more valuable within off-peak. This is true for both case 1 and 2.

For case 2, this has resulted in higher level of service offered by the shipper to the receivers. The workload of the driver has increased since there are more activities surrounding the unloading of goods, which takes more time. More time is also spent on unloading since it has to be conducted as quietly as possible. This somewhat counteracts the efficiency gain created by off-peak deliveries. According to the head of transport at the shipper, the estimated time gain is still positive, but not substantial enough to contribute to quantifiable savings. There have also been
instances when the chilled and frozen goods are placed in the wrong part of the storage facility, e.g. in room temperature, which often results in having to throw away some of the food. This causes a lot of disruptions for the business operations since these deliveries have to be replaced quickly during the morning or the manager has to redo the planning.

**Communication**

In both cases, the communication between the stakeholders increased initially, which were necessary in order to implement off-peak deliveries, hence the communication was crucial to the value creation, although it constitutes an indirect value-creating factor. After the implementation, the communication returned to a normal level.

In the case of the grocery chain and the carrier, the communication is just slightly above normal at this point, since they still have to do some follow-up work regarding noise levels. The route planning has become more micromanaged according to the head of logistics at the grocery store, which increases the communication to some extent.

For the wholesaler of case 2, the communication with the customers has in some instances even decreased since there are fewer delays when using off-peak deliveries; therefore the communication regarding delays has decreased.

Some of the communication has been transferred further down in the organization since the demand for accuracy when sorting and loading of the goods has increased which means that there is more communication at an operative level according to the owner of the carrier. In general the view from the interview is that the communication has improved and become clearer rather than increased.

### 5.1.6 Case-Specific Resources and Processes

The cases are quite different; hence some resources and processes are only used in the specific case.

**Case 1 – The Grocery Chain**

**Resources**

**Owner Structure of the Grocery Store**

The centralized owner structure of the grocery store does not necessarily increase the value of off-peak deliveries but it has made it much easier to implement a switch to nightly deliveries. According to the head of logistics at the grocery store, the organizational structure contributes to shorter lead times when it comes to decision-making, where the decisions are made centrally. Furthermore, the supply chain is highly integrated which enables a logistical planning that can utilize economies of scale to a greater extent.

As described in previous studies of off-peak in section 4.1, it can be problematic that benefits from off-peak deliveries are obtained unevenly throughout the supply chain, since it lowers the incentives to be a part of the delivery method for certain stakeholders. However, this affects the grocery chain to a lesser extent because the company is able to obtain value from several parts of the supply chain since they own a wider part of the chain. By owning the goods and channels, they can control a larger part of the supply chain and can optimize their operations on a larger scale.
Experience
The grocery chain has conducted off-peak deliveries for practically all of the stores where nightly deliveries are allowed, such as in the suburbs of Stockholm. Therefore, they are used to these processes and have not been forced to change any of the methods at the central warehouse facility, which means that the company have managed to avoid some of the potential cost increases of off-peak deliveries. Therefore, having made fewer changes to the operation definitely brings value to the company.

The carrier also has a lot of experience in nightly deliveries. 50% of the carrier’s deliveries take place during the night, which means that they are already experiencing the positive effects associated with nightly deliveries. This, however, makes it more difficult to quantify the positive effects of the studied off-peak deliveries since it is harder to determine which effects are directly linked to the inner city trials.

Hybrid Truck
The hybrid truck both contributes to the value creation and constitutes a requirement of off-peak deliveries. It contributes to the value that is created from the improved market positioning, since it is an innovative product that also benefits the environment. The range of the electric drive is unfortunately not much more than a kilometer; hence the fuel consumption of the truck is only lowered by approximately 4%. The price of a hybrid truck is considerably higher than a regular diesel truck but will be discussed further in section 5.3.

Modified Loading Zones and Special Equipment
There have been several modifications of the loading zones, including softer asphalt, a ramp and quiet forklifts. These modifications have been made to uphold the requirement of the City of Stockholm and do not contribute directly to the value creation for the companies within the supply chain. The modifications are valuable indirectly since they enable that off-peak deliveries can be permitted.

Processes

Unassisted Deliveries
The grocery chain only uses assisted deliveries at one of the three inner stores, due to the fact that the conditions at the store made it impossible to rebuild it into an unassisted facility. Using mainly unassisted goods reception creates the increased flexibility regarding delivery time that enables more dispersed deliveries, thus using the trucks more efficiently. Therefore, this resource constitutes a factor that enables value creation but does not increase the value creation itself.

Logistical Planning
Since off-peak deliveries were implemented, the logistics has been improved, both in regard to routes and truck usage, but also in terms of personnel hours used for sorting goods at the stores. The benefits to the logistical planning is that off-peak deliveries have created more logistical options and improved quality that has enabled a streamlining of logistical activities. By utilizing the logistical possibilities, the value creation have increased since resources (such as the trucks) are now used more efficiently which lowers the costs of the operation.

Initially the amount of time spent on logistical planning increased during the implementation phase because many different logistical flows were affected, but this was only temporary. The grocery chain manages its own planning of logistics and the carrier has to adapt to the schedule. The downside of the logistical change for the three inner city stores is that the off-peak distribution in the inner city has only been given a temporary permission to deliver during the
night and is a part of a research project which means that the three stores are bound to one specific truck and it is not possible to change the logistics of this setup. Hence the logistics is not as flexible as it could have been.

Case 2 – The Shipper and Receivers

Resources

Loading Zones
Many of the customers of the wholesaler do not have sufficient areas to unload the trucks, and therefore the loading zones often constitute an inadequate resource in this case. The change to off-peak deliveries contribute to that this resource becomes less significant to the operation. As previously mentioned, the loading zones are more accessible at night due to less competing traffic, and if the receiver does not have a loading area nearby there is also a lowered risk of blocking the street during the night.

Gas Truck
The gas truck is a significant resource in the same way as the hybrid truck is in case 1, since it contributes to the value creation of the positive market positioning by constituting a more sustainable investment. It is also part of the requirement of the City of Stockholm.

Processes

Sorting of Goods at the Warehouse
The sorting and packaging of goods has to be conducted more carefully now, since the new delivery method requires a more accurate loading of the goods, with a clear separation of frozen, chilled and dry goods. The more accurate process has to start already at the warehouse. Having separated the goods in the correct categories in the truck will ease the driver’s work at the customer facility. This is necessary when the deliveries are unassisted and it is the driver’s responsibility to carry in the goods and make sure that they are stored at the right temperatures. It is also necessary during assisted deliveries if the receiving personnel are not used to sort the goods themselves, for example if a janitor has this responsibility.

This is a necessary support function that absorbs time and resources but without creating any value on its own. The processes at the warehouse takes a bit longer with off-peak deliveries, about 20-30 minutes per night, but the wholesaler has not been forced to increase personnel hours according to their head of transport. It was difficult to implement this change in processes and it took a while before inaccuracies were reduced and the employees got used to the new procedures. The opinion is that this could be improved further and that the more detailed management of the goods could start even further back in the supply chain. This is also connected to the communication amongst the personnel, both at the storage facility and with the drivers. The communication was crucial to the implementation of new processes at the storage facility.

A Mixture of Delivery Methods
All of the receivers of case 2 have their own specific delivery needs and requirements; hence the delivery methods vary between different receivers. Both assisted and unassisted deliveries are used but the majority of the receivers use assisted deliveries. According to the head of transport at the wholesaler, the aim of the delivery method is to keep the costs down; otherwise the costs would outweigh the benefits of off-peak deliveries, and to not cause disruptions for the regular business of the receivers. It was even stated during the interviews with both the wholesaler and the receivers that the receivers would not accept off-peak deliveries if it required too many
changes of the regular operation and if it resulted any added costs, where the cost factor was the most important one. The following text describes the different methods used.

Assisted deliveries are only used when the receiver has its regularly scheduled personnel available to accept the goods during off-peak hours. Although, it varies from case to case if the same personnel that used to receive the goods before off-peak deliveries were used, or if other employees have to accept goods, such as janitors or cleaning personnel. In this case, all of the receivers that use assisted deliveries have not been forced to extend personnel hours in order to be present for the deliveries, which keeps the costs down. According to the interviews with both the receivers and the shipper, this constitutes a requirement to be able to take part in assisted off-peak deliveries since extra personnel hours are too costly. They are also exposed to the risk of changing work schedules which can make it impossible to continue with off-peak deliveries without extending personnel hours. One receiver that initially was a part of off-peak deliveries reduced their opening hours, which meant that the chefs that used to receive the goods during off-peak hours were no longer able to accept the goods during their regular working hours. The cost of extending their shift was deemed unacceptable for the company, which led to a switch back to daytime deliveries instead.

Many of the unassisted and the some of the assisted deliveries, typically those that use personnel that usually do not sort goods, are dependent on a clear separation of the delivered chilled, frozen and dry goods and that it is the driver that takes responsibility for sorting the goods and placing the goods correctly in the storage area. This has been problematic but as the time progressed, many of the delivery errors were eliminated, as previously mentioned.

Except for the delivery errors when sorting the goods, the unassisted deliveries are beneficial since they are more flexible and there is no risk of added personnel costs. The receivers in this case that use unassisted deliveries have not rebuilt any part of their storage area, since this would result in added costs, which is generally not accepted. Several receivers mentioned that it is not an option for them to give the drivers access to the storage premise since this meant that the drivers would have access to the entire facility, which was considered too great of a risk. Instead the goods are placed in a locked area in room temperature and have to be delivered closer to the opening hours of the receivers. Placing the goods in room temperature is not a preferred method since there is a risk of reducing the quality of the goods even though the personnel arrive shortly thereafter. These kinds of unassisted deliveries make it more difficult to handle goods return as well, since they cannot leave the incorrect deliveries of chilled and frozen goods in room temperature in the evening when the truck arrives in the early morning. Instead, the shipper has sometimes sent a truck to pick up the returned goods during the day. For unassisted deliveries where the driver has access to the freezers and refrigerators, it is still difficult to communicate which products that are supposed to be returned.

For the shipper, it is preferred to use assisted deliveries since the responsibility of the goods is transferred to the receiver after the driver has delivered the goods.

**Logistical Planning**

The time spent on planning the logistics has not increased that much according to both the shipper and the carrier. The main difference is that when a new customer has signed on to off-peak deliveries, the shipper and the carrier have to visit the receivers and spend more time on assessing whether it will be possible to deliver goods during off-peak hours, which delivery method that is appropriate and other adjustment that are needed. This can be time-consuming but will ensure that fewer disruptions occur which could counteract the benefits of off-peak deliveries; hence it can also be seen as an important support function.
Off-peak deliveries have also meant that the wholesaler plans the logistics surrounding the gas truck during off-peak hours. When using daily deliveries, the wholesaler transferred the logistical planning to the carriers since this resulted in a greater motivation for the carriers to become more efficient which benefits the wholesaler in the end.

For the receivers that take part in off-peak deliveries, the planning surrounding the management of the goods is easier since they know exactly when they have access to the goods. Just as the case with the grocery chain, a few of the receivers have reduced the number of personnel hours needed to take care of the delivered goods. In general, the goods reception is now less disruptive to the regular business operations. Due to the different conditions of the businesses, these savings are not as substantial as in case 1, since the receivers in case 2 handle smaller volumes of goods and are not as pressured to handle the goods quickly. As previously mentioned, the grocery chain has to refill empty or almost empty shelves before the store opens, which meant that before off-peak deliveries they had more personnel available to handle the goods in case of delays.

**Selling Off-Peak Deliveries**

Convincing receivers to be a part of off-peak deliveries is crucial to the value creation since a sufficient volume of goods is needed to retain a high filling degree of the truck. Otherwise the cost per delivery stop or per delivered volume increases, which means that the truck is not be used efficiently, thus counteracting the efficiency gains of e.g. faster driving speed. This is also related to the pricing model used, which is discussed further in section 5.3.1.

When off-peak deliveries were initiated, the carrier first convinced the wholesaler to be a part of the new delivery method. Subsequently, it was the wholesaler that had the responsibility to pitch off-peak deliveries to its customers. The sales team of the wholesaler has mainly approached customers with suitable conditions for nightly deliveries, either those that have nightly operations or at least personnel present during the night. Some customers have also requested a different delivery method if they have experienced problems with the daytime deliveries. In those cases, the sales staff has suggested off-peak deliveries.

The general rule regarding the receivers in case 2 is that the ones that accept off-peak deliveries only do so if there are no added costs which means that the new delivery methods have to be compatible with the regular business operations. According to some of the receivers, they chose to switch to nightly deliveries because they were not satisfied with the delivery reliability of the daily deliveries, but even in these cases they do not accept added costs for the deliveries. The cost-sensitivity is a problem when pitching off-peak deliveries and reduces the number of potential prospects. Even when off-peak deliveries prove successful for the receivers there is still a lack of willingness to pay extra for nightly deliveries. This was also a problem during off-peak trials in other cities, which is described in section 4.1.

When proposing a switch to nightly deliveries, the wholesaler has also been forced to offer a higher service level in regard to sorting and carrying the goods to the storage facility of the receiver, in order for the receivers to accept off-peak deliveries.

According to both the wholesaler and the carrier, there is a lack of information from the wholesaler to its customers regarding off-peak deliveries. The sales effort is not enough and there is also a surprisingly large amount of customers who turn down off-peak deliveries when suggested to them. The sales process is rather risky which is why the personnel are more passive in regard to selling off-peak deliveries. If off-peak deliveries would become problematic for a customer, there is a substantial risk that the customer will leave and hire another wholesaler instead of just changing back to daily deliveries again. That is why the sales team is
sometimes reluctant to sell off-peak to larger customers. They are not as risk prone as they would need to be in order to convince more customers to change to off-peak deliveries.

When the wholesaler has been successful in convincing a customer to switch to off-peak deliveries it becomes easier for the sales team to retain the customer because of the lock-in effect created by the exclusive permission to drive at night, which was discussed in section 5.1.4. However, the negative side of the exclusive permission is that it is only temporary, which increases the risk associated with selling nightly deliveries. The reluctance to pitch off-peak deliveries increases since there is a risk that the permission is terminated after the project ends, which will leave the receivers disappointed if they have gotten used to off peak deliveries. Customer satisfaction is very valuable which is why these kinds of risks are avoided if possible.

According to the shipper, they want to promote off-peak deliveries by emphasizing the increased quality of deliveries. For them, it is not an option to give the receivers a discount when switching to nightly deliveries, partly because the delivery method does not produce enough savings compared to the costs in this early phase of the implementation. The same observation was made during e.g. the trials in New York; that the savings were not enough to discount off-peak deliveries. However, the difference is that in New York it was mainly suggested that the carriers would be the ones to obtain enough savings to lower the price. This is discussed further in section 6.4.

5.2 Value Proposition

The value creation of off-peak deliveries generates an improved value proposition for several of the stakeholders. Not all of the value creation as described in section 5.1 is a part of the offering to a customer; instead it contributes to increased internal value for the stakeholders. However, much of the value creation impacts the offering from some of the different stakeholders. It is also important to have stated how off-peak deliveries affect the value proposition of the stakeholders when analyzing the value capturing since this will make it clearer how the stakeholders capture part of the value that is offered to the customer, which is described later on in section 5.3.

The following section describes how the value proposition of the stakeholders is improved when switching to off-peak deliveries in Stockholm.

Case 1.

The Carrier’s Improved Value Proposition Towards the Grocery Chain

More efficient deliveries – off-peak deliveries increase the driving speed due to reduced traffic at night.

Greater possibilities to improve logistics – with off-peak deliveries, the carrier enables the grocery chain to meet the delivery requirements of the individual grocery stores while still improving the routes and the truck usage.

Improved delivery reliability – off-peak deliveries provides better conditions for planning personnel activities since the grocery chain will know more precisely when the deliveries arrive from the carrier, which leads to less personnel time needed to handle the goods after delivery.

No congestion fees – there are no congestion fees during off-peak hours.

More environmentally friendly deliveries – the offering enables the grocery chain to be in the forefront of sustainable development, which also includes positive market attention and provides the grocery chain with marketing opportunities.
Case 2.

The Carrier's Improved Value Proposition Towards the Shipper

**Improved customer satisfaction** – with off-peak deliveries, the carrier improves the shipper’s value proposition towards the shipper’s existing customers.

**Improved market positioning** – the offering from the carrier places the shipper in the forefront of technical and sustainable development with increased efficiency and quality of deliveries. The offering also includes a position as an exclusive provider of off-peak deliveries to the shipper's own customers. It also creates positive market attention and provides the shipper with marketing opportunities.

**Greater possibilities to improve logistics** – off-peak deliveries enable the shipper to meet the delivery requirements of its customers while creating some relief for the morning deliveries when moving deliveries to off-peak hours, thus creating opportunities to increase the delivery volume during the day without increasing the cost of the trucks.

**Fewer parking fines** – off-peak deliveries result in fewer parking fines since it is easier to access loading zones during the night, hence there is less of a need to park illegally.

**No congestion fees** – there are no congestion fees during off-peak hours.

The Shipper's Improved Value Proposition Towards the Receivers

**Improved delivery reliability** – creates better condition for planning personnel activities since the customers know more precisely when the goods arrive, which leads to less personnel time needed to handle the goods after delivery. It reduces the number of disturbances to the regular business that used to be a result of delayed deliveries.

**Provides a greater window of time to correct delivery errors** – this also reduces disturbances for the regular business.

**Increased service level when unloading the goods** – the receivers to not have to use their own personnel for some of the goods sorting, instead this is carried out by the driver, without charging the receivers for the service.

**More environmentally friendly deliveries** – many companies are more aware of their environmental impact and place value in being able to reduce their impact on the environment, both as an internal policy and in regard to external scrutiny.

5.3 Value Capturing

This section will describe how the different stakeholders capture the added value that is created from off-peak deliveries. First, the pricing models used in the studied relationships are presented, followed by a description of how this affects the distribution of profits and costs.

5.3.1 Pricing models

Understanding the pricing models used is important to identify how the created value is captured and distributed throughout the supply chain. This also affects the incentives for each stakeholder to strive for greater efficiency, and also the incentives to shift to off-peak deliveries. The pricing models for deliveries are displayed for all transactional relationships in the studied part of the supply chain. The pricing models are shown as before off-peak deliveries, or normal operations, and during off-peak deliveries. “During off-peak deliveries” implies the pricing used during the pilot project.
Case 1.
The pricing model used for normal operations and for off-peak deliveries can be seen in Table 3. The carrier charges the grocery chain a fixed price per shift purchased (a certain amount of hours of disposing one truck with driver), as well as a variable price of each kilometer driven. The fixed price is based on the costs for the truck and driver, while the variable price is based on fuel consumption, wear on tires etc. The carrier also transfers all of the congestion fees directly to the customer, and sometimes also fines. The pricing model between these actors has not changed with the shift to off-peak deliveries.

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Customer</th>
<th>Normal operations</th>
<th>Off-peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrier</td>
<td>Grocery chain</td>
<td>• Per shift and per km</td>
<td>• Per shift and per km</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Transferred congestion charges</td>
<td></td>
</tr>
</tbody>
</table>

Cost Structure
The salary cost of the driver constitutes a larger part of the price of transport, approximately 44% according to the owner of the carrier. The cost of the hybrid truck constitutes approximately 25-26% of the total price of transport, while the cost of a normal diesel truck usually constitutes 18% of the price for transport according to the owner of the carrier; hence the use of a hybrid truck in this case increases the price somewhat for the grocery chain. However, if the hybrid truck were purchased at today's value it would constitute approximately 35% of the price. Although, this would only lead to an estimated 4% increase of the total price of deliveries. The extra salary that the driver receives for working unsocial hours constitutes approximately a 20% increased salary compared to working regular hours.

No internal invoicing
There is no internal invoicing between the grocery chain and its stores, and the carrier sends its bills to central office of the grocery stores; hence the different stores do not pay for the deliveries. The stores also do not pay for any of the modifications or reconstructions that have been needed to use off-peak deliveries. The owner structure of the stores is centralized and the costs and savings in regard to off-peak deliveries are under the control of the central office.

Case 2.
The pricing model before and during off-peak deliveries can be seen in Table 4.

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Customer</th>
<th>Normal operations</th>
<th>Off-peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrier</td>
<td>Wholesaler</td>
<td>• Performance based: per delivery point, cage, return cage</td>
<td>• Hour based</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Some deliveries hour based</td>
<td>• Some transferred fines</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Transferred congestion charges</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Some transferred fines</td>
<td></td>
</tr>
<tr>
<td>Wholesaler</td>
<td>Receivers</td>
<td>• Included in price of purchased goods</td>
<td>• Included in price of purchased goods</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Delivery fee added for very small volumes</td>
<td>• Delivery fee added for very small volumes</td>
</tr>
</tbody>
</table>

Table 3. Pricing model of case 1

Table 4. Pricing model of case 2
Pricing Between the Carrier and the Wholesaler

During normal operations, the carrier charges the wholesaler a performance-based fee, i.e. a fixed price per delivery point, per cage delivered and per cage taken in return. However, for deliveries during peak hours in the afternoon, they charge per hour of disposition of truck and driver. This is due to the uncertainty regarding how much time deliveries at that time will take depending on traffic, and if the standard performance based fee was used, the carrier might get undercompensated if the deliveries take longer than anticipated, since it is the carrier that has to bear the cost of working overtime. This risk is considered too high during the afternoon peak traffic, and therefore a per-hour charge is used. This pricing model is also used for the off-peak deliveries, except there is a minimum charge of 8 hours. This is due to the low volume of deliveries currently performed during the night shift. There are not enough delivery points to use performance-based pricing, therefore the carrier charges for a minimum of 8 hours to make sure the investment into off-peak deliveries is covered. As in case 1, congestion charges, and sometimes fines, are transferred to the customer.

Cost Structure

The salary cost of the driver constitutes a larger part of the price of transport, approximately 44% according to the owner of the carrier. The cost of the gas truck constitutes approximately 22-24% of the total price of transport, while the cost of a normal diesel truck usually constitutes 18% of the price for transport according to the owner of the carrier. The extra salary that the driver receives for working unsocial hours constitutes approximately a 20% increased salary compared to working regular hours.

Pricing Between the Wholesaler and the Receivers

Generally, the wholesaler does not charge the receivers explicitly for deliveries. Instead, the receivers only pay for the goods purchased, and the delivery is included. Naturally, the prices of the goods are set to cover the cost of the deliveries, but this is non-transparent to the customers and not specified on invoices etc. However, for orders of very small volumes, a delivery charge is added to cover the costs of the transport. The pricing model has not changed during the off-peak project, and the receivers still only pay for goods purchased.

5.3.2 Distribution of Profits and Costs

The pricing models described above affect the distribution of profits and costs throughout the supply chain. The figures below show where in the chain savings and costs occur, and also how they are transferred to other actors through pricing. The items considered are those that directly imply a financial gain or loss as a result of switching to off-peak deliveries.

Case 1.

As shown in Figure 8, the grocery chain ultimately ends up with the most significant savings and also all of the costs in case 1. This is due to the pricing model used, where the carrier charges a fixed rate for each shift. The price of the shift includes costs for the more expensive truck, as well as supplementary pay for the driver, which means that these costs are transferred to the grocery chain. The pricing model also leads to savings for the grocery chain as a result of increased transport efficiency. The more efficient deliveries means that the grocery chain can get a higher volume of goods delivered during one shift, and thereby they can reduce the number of shifts purchased.
The increased delivery reliability leads to significant reduction of personnel costs at the stores. At the stores using unassisted deliveries, the goods are always accessible when the personnel arrive in the morning, which means they can start handling the goods immediately. Before the use of off-peak deliveries, the personnel often had to wait for the deliveries and their time was not utilized in an optimal way. At the store using assisted deliveries during off-peak hours, the time of delivery is more reliable and thus less time is spent waiting for the deliveries. For the carrier, the reduced uncertainty of time spent in traffic also results in less non-chargeable time for the truck and driver. The pricing model where the grocery chain pays a fixed price for the shift regardless if it takes more time than assigned can otherwise result in unpaid hours when the deliveries are delayed due to heavy traffic.

There is also a fee paid per km driven which includes a standard fee for fuel. Since the truck is an electric hybrid, which consumes less fuel than a standard diesel truck, some savings are created for the carrier; however, the reduction in fuel costs is only about 4% according to the owner of the carrier. Congestion fees are transferred directly to the grocery chain, which means that the reduced amount of congestion fees as a result from driving at night, compared to during peak hours when the congestion fees are at their highest, becomes a saving for the grocery chain. The reduced repair costs due to less traffic incidents result in a saving for the carrier, however it has not been quantified, therefore it is not certain how big of an impact it has on the total cost management.

There is also a fee paid per km driven which includes a standard fee for fuel. Since the truck is an electric hybrid, which consumes less fuel than a standard diesel truck, some savings are created for the carrier; however, the reduction in fuel costs is only about 4% according to the owner of the carrier. Congestion fees are transferred directly to the grocery chain, which means that the reduced amount of congestion fees as a result from driving at night, compared to during peak hours when the congestion fees are at their highest, becomes a saving for the grocery chain. The reduced repair costs due to less traffic incidents result in a saving for the carrier, however it has not been quantified, therefore it is not certain how big of an impact it has on the total cost management.

The grocery chain had some initial costs attributed to the reconstruction of unloading zones at the stores to facilitate unassisted deliveries, as well as development costs of silent equipment, but these were one-time investment costs. In sum, the grocery chain ends up with most of the savings as well as the extra costs. The savings, primarily from the reduced number of shifts and reduced personnel costs at the stores, outweigh the extra costs and therefore makes this a net financial gain for the grocery chain. The grocery chain has managed to quantify the savings from

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**Figure 8. Distribution of profits and costs in case 1**

The grocery chain had some initial costs attributed to the reconstruction of unloading zones at the stores to facilitate unassisted deliveries, as well as development costs of silent equipment, but these were one-time investment costs. In sum, the grocery chain ends up with most of the savings as well as the extra costs. The savings, primarily from the reduced number of shifts and reduced personnel costs at the stores, outweigh the extra costs and therefore makes this a net financial gain for the grocery chain. The grocery chain has managed to quantify the savings from
the reduced number of truck shifts and the personnel hours for handling the received goods. Therefore it has been possible to calculate a payback time in this case, which indicates a positive business case for the grocery chain. For the carrier, many of the savings have not been quantified but based on the interviews with the carrier it is possible to conclude that they are not as substantial as the savings of the grocery chain. However, since the carrier transfers all of the costs to the grocery chain, it is possible to conclude that the business case for the carrier is positive. According to the owner of the carrier, the improved market positioning is very beneficial for the company, but it has not been possible to quantify this as added sales since it is very difficult to determine the direct impact of off-peak deliveries. Therefore, it is also difficult to estimate the magnitude of the financial gain from the improved market positioning, compared to the other savings of off-peak deliveries. The business cases are displayed in Figure 9.

Case 2.

In case 2, the distribution of profits and costs is more dispersed than in case 1, partly because there are more actors involved. As can be seen in Figure 10, the extra costs for the truck and supplementary pay for the driver are transferred to the wholesaler, just as they are transferred to the grocery chain in case 1. The wholesaler also incurs a small cost for a few silent rolling cages that are marginally more expensive than regular ones, for testing within the project.

The reduced congestion fees and some of the traffic fines become savings for the wholesaler as they are transferred from the carrier. The traffic fines that are a direct result of non-existent or insufficient loading zones at the receiver’s facility are transferred to the wholesaler. The reduced repair costs become a saving for the carrier as in case 1.

The utilization rate of the truck is in this case a benefit for the carrier. The possibility to use the truck both during the day and night makes it possible to increase the earnings per truck. During the day shift, the wholesaler does not have to pay for the more expensive technology, i.e. the extra cost of a gas truck (compared to a diesel truck). The cost of the truck that the wholesaler pays for during the day shift constitutes approximately 18% of the total transport price, hence this amount will constitute extra earnings for the carrier when also selling a shift during the day, since the cost of depreciation is already covered during the night shift.

No extra costs are transferred to the receivers from the wholesaler, and they do not incur any extra costs on their end. Furthermore, a few of the receivers enjoy benefits of reduced personnel costs because of increased delivery reliability. Hence, this is financially neutral or results in a financial gain for the receivers.
In case 2, the carrier receives the greatest financial net benefits at the current stage, primarily due to the utilization rate of the truck. A few of the receivers also have minor savings from reduced personnel hours needed to take care of the delivered goods, because of the increased delivery reliability. Also in this case, many of the savings have not been able to be quantified. Although, given that the carrier transfers its costs to the wholesaler, it is possible to conclude that the business case of the carrier is positive. The receivers to not have any added costs, which is why the business case is positive for a few that achieve lowered costs and neutral for the rest. All of the receivers benefit from the improved reliability since it causes fewer disruptions for the regular business, even though this does not result in direct savings for most of the receivers. According to the head of transport at the wholesaler, they are optimistic about the possibilities of off-peak deliveries but cannot state any savings as of today. Since the costs of unsocial hours and the more expensive truck are transferred to the wholesaler and there is a lack of savings, it can be concluded that the business case is not positive for the wholesaler. The business cases are displayed in Figure 11.
5.3.3 Analysis of the Value Capturing

The pricing models used in the studied supply chains are the results of many different aspects, such as each actor’s preferences and goals, the relative negotiation power between the actors, and external factors.

Negotiating Power

The shippers generally have more negotiation power in this kind of supplier-buyer relationships than the carriers, since the transport business is a competitive business, with many competing actors providing a simple and often undifferentiated service. In the studied cases, the shipper (wholesaler) and shipper/receiver (grocery chain) have both managed to get the pricing model they prefer from the transport company during normal operations.

The wholesaler and the grocery chain prefer to pay a fixed price for the carrier’s services, either by paying per shift or using a performance-based pricing, i.e. paying per delivery point and per cage. Given these pricing models, the customer is not affected by delays or traffic – instead the carrier is the one taking the risk of not receiving payment for extra time needed to make all of the deliveries. This means that the costs for transport for the wholesaler and grocery chain are predictable. On the other hand, the preferred pricing model of the carrier is to receive payment on an hourly basis, meaning that they get paid for the time that it actually takes to deliver all of the goods. This pricing model eliminates the risk for the carrier of uncompensated working hours. However, this pricing model reduces incentives for the carrier to operate with greater efficiency.

There is an exception regarding pricing models in case 2, where the shipper has agreed to pay an hourly price for some deliveries. This occurs during the afternoon since the risk of not delivering on time is considered to be too high, which would lead to substantial amount of unpaid hours for the carrier. An hourly-based price is currently also used for off-peak deliveries, due to the low delivery volume. By using an hourly-based price in case 2, the carrier obtains savings because there are no longer any unpaid overtime, which can otherwise be the case when the carrier charges a fixed price and is unable to deliver on schedule. This saving would still be possible during off-peak hours even with a fixed price since the increased efficiency and reliability created by reduced traffic and more accessible loading zones make it easier to complete the schedule on time, hence the risk of unpaid overtime is substantially reduced.

Performance-Based Pricing During Off-Peak Deliveries

If the volume were to increase, performance-based pricing is likely to be used for these deliveries in the same way as during the normal operations. Naturally, this potential change of the pricing model would affect the distribution of profits and costs in the supply chain. One factor that impacts the performance-based price is the income that the carrier needs per hour to cover costs; hence they estimate how many stops that can be reached per hour to be able to determine the price per stop. The transport costs are higher during off-peak hours because of the higher salary costs for the driver and the more expensive truck. On the other hand, if the transport efficiency is sufficiently increased due to reduced traffic, more stops could potentially be reached in one hour; hence the costs per delivery stop would be reduced. However, this is dependent on that there is enough volume to deliver. If there are very few receivers during off-peak hours, the cost of the truck will be distributed over fewer stops; hence the cost per stop will be very high, which can counteract the benefits of the increased transport efficiency. But if the available volume and the efficiency gain were large enough, the reduced costs would be a direct gain for the carrier, since the price is fixed per stop and per cage. Hence, the carrier would be able to complete more deliveries per time unit. However, the price is likely to be renegotiated
by the shipper in this case, which would lead to the profits being shared between these actors, or perhaps being transferred to the shipper altogether.

**The Pricing Model’s Impact on the Receivers**

A few of the receivers in case 2 make real financial savings from off-peak deliveries already, due to reduced staff hours. All of them experience increased value of the deliveries because of the improved reliability. This value is something that they currently are not paying for, since they pay the same price as they would for daytime deliveries. Since the wholesaler incurs a higher cost for the off-peak deliveries at the current stage, this is a kind of discount given to the receivers. Despite this, the wholesaler still experiences reluctance from other receivers to participate, which is something that has been found in several off-peak projects. With an increased volume and thereby larger savings from efficiency, profit sharing with reduced prices could be possible throughout the supply chain, which could create incentives for more receivers to participate. However, a challenge is to get more receivers to participate at this stage, while the savings are slim and therefore there is no profit to share.

**The Price Level of Off-Peak Deliveries**

Reducing the prices of off-peak deliveries with resulting losses in the short term could be viable with promises of profit when the delivery volume increases, but there is a risk that the participation still would not become large enough. For the carrier, the low margins also make it difficult to reduce prices, especially considering that their profits in the long term are unclear. For the wholesaler, the pricing model complicates reducing prices for deliveries since they are implicitly included in the price of purchased goods. To reduce prices for deliveries, they would need to use some kind of discount on the goods, which is less transparent and more complicated. The wholesaler also expresses reluctance to use price reduction to convince receivers to shift to off-peak deliveries. They would rather use the increased quality of the deliveries and the added value for the customers as an incentive to switch. Therefore it is important to find receivers for whom off-peak deliveries adds enough value without creating extra costs in order to reach a sufficient volume.

A reluctance to pay for deliveries was identified with the receivers in case 2. Even though the costs of deliveries are included in the price of the goods, the receivers do not perceive this cost. The problem with not charging for deliveries is that it makes it difficult to send price signals for deliveries that result in higher costs, such as complicated delivery situations or deliveries at peak hours. This reduces incentives for receivers to contribute to reducing total costs in the supply chain. However, changing this way of pricing is difficult, considering the customers’ aversion to delivery fees and their negotiation power in relation to the shipper. Charging for deliveries would reduce customer satisfaction, and might make them switch supplier.

**Unbalanced Value Capturing**

Off-peak deliveries create increased value in the supply chain, and in this section the capturing of that value has been studied. One of the largest values is the one created as a result from the increased transport efficiency due to reduced traffic. In case 1, it is clear that although this value is created by the carrier and is a part of the carrier's value proposition toward its customer, the carrier do not capture that specific value. Instead, this is an added value that results in savings for the customer, the grocery chain. This is also the case with the value of the delivery reliability. This is not necessarily a problem since the carrier can capture other values such as an improved market positioning that is a result of e.g. being able to offer increased transport efficiency, but it will affect the incentives of the different stakeholders, particularly if the certain values are more easily quantified compared to others.
In case 2, the low delivery volume reduces the value for the wholesaler, but if the volume were to increase and all of the transport hours that are paid for would be utilized, the value of efficiency would make off-peak deliveries more financially beneficial. With a possible change of pricing model into a performance based one, the carrier could capture some of the value created by efficiency and reliability, depending on how prices are negotiated.

The delivery reliability is an added value for the receivers, which is not captured by the wholesaler. However, the added value increases the customer satisfaction and, for now, an important competitive advantage. The increased service level of drivers carrying goods into storage areas etc., is another added value that is not captured by neither the carrier nor the wholesaler. This increased service level also results in more time being spent at the delivery stops. This is not a problem as long as the volume is low, but an increased volume could reduce the efficiency gain.

Another possible value is the increased utilization of the truck. This value is captured by the carrier in case 2, where the company is able to use the truck both during the day and night. In case 1, the truck is only used by the grocery chain at night and it is not used during the day. Therefore, the value of increased utilization is not captured in case 1. Since the truck is striped with the grocery chain's logo, it will be difficult for the carrier to use this truck when delivering to other customers. However, delivering to new customers during the day shift instead of using the day shift for the same customer as the night shifts should enable the carrier to capture most of the value of the increased utilization for itself. If the same customer utilizes the day shift as well as the night shift it is more likely that the customer will demand a price reduction since the cost of the truck is distributed over more hours. If two separate customers utilize the different shifts it decreases the risk of them demanding that kind of profit sharing since they are less aware of it.

**Summary**

Studying the value capturing in these two cases indicates that there is potential for transport buyers to make significant savings due to the increased efficiency of off-peak deliveries, and that sufficient volume is important to realize such savings. It also shows that there is a possibility for receivers to make savings as a result of the increased delivery reliability. The pricing models used affect how these savings are distributed and how the value is captured, and even though some of the value is not captured, the business cases for all included parties seem promising. For the wholesaler the business case will be dependent on increased volume and sufficient efficiency gain to reduce costs, but other values like increased customer satisfaction and lock-in effects are very important and need to be taken into consideration.

### 5.4 Truck Manufacturers’ Part in Off-Peak Deliveries

The truck manufacturers do not have an active part in the everyday distribution within the supply chain but they are still considered to be stakeholders within the supply chain surrounding off-peak deliveries since they provide products that are necessary for off-peak deliveries. The truck manufacturers have a special interest in new initiatives within the distribution industry and aim to generate products and services that increase the value for the carriers and the customers of the carriers. When changing regulation within the distribution industry, the truck manufacturers are also affected and need to adapt their products and services.


5.4.1 Value Creation

Off-peak deliveries also create value for truck manufacturers since a new niche market is created for more expensive specialized trucks, given the requirements of the City of Stockholm. Environmentally friendly trucks are more expensive than regular diesel trucks and the development and production costs are high while sales volumes are very low compared to diesel trucks. There is a lot of uncertainty regarding the residual value of e.g. hybrid trucks, according to the owner of the carrier, since this product is not commonly used. Being able to find customers for these more expensive products is very valuable for the truck manufacturers and that is why off-peak deliveries have a lot of potential.

From an environmental perspective, off-peak deliveries are also valuable since the new delivery method improves the market positioning of the truck manufacturers. Contributing to sustainable goods distribution is definitely beneficial for the truck manufacturers and improves their branding possibilities. They are able to provide the customer with a complex solution that increases the efficiency, quality and sustainability of deliveries, and this can definitively improve the truck manufacturers’ position on the market.

It is, however, very uncertain how large the market will be for off-peak products in the future; therefore it is not possible to evaluate the impact on the truck industry. The particularly small scope of off-peak deliveries severely limits the value creation at this stage. Since only two trucks have been sold as a part of the pilot project, the value from sales is negligible at this stage and the value from the improved market positioning is difficult to quantify.

5.4.2 Value Proposition

Off-peak deliveries also affect the truck manufacturer’s offering to the carrier.

The Truck Manufacturers’ Improved Value Proposition to the Carrier

Truck technology that reduces noise levels – the offering helps the carrier to comply with the requirements of the city of Stockholm.

More environmentally friendly trucks – the offering improves the market positioning of the carrier. Using eco-friendly trucks will provide the carrier with an opportunity to improve its brand in regard to sustainability and attract customers that prioritize sustainability.

5.4.3 Value Capturing

The truck manufacturers only capture a marginal part of the value that is created from off-peak deliveries, in the form of somewhat more expensive trucks.

Pricing

The pricing model between the truck manufacturer and the carrier can be seen in Table 5. Normally, the carrier both leases and purchases trucks from the truck manufacturer. During the off-peak project, both trucks are leased. This is a financial lease, which means that the carrier will own the truck and is left with the residual value of the truck at the end of the leasing period. The lease includes a repair and maintenance contract for normal wear and tear repairs. Repairs due to damages from traffic incidents are not included and are charged separately.
Table 5. Pricing model of the truck manufacturer

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Customer</th>
<th>Normal operations</th>
<th>Off-peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck manufacturer</td>
<td>Carrier</td>
<td>• Lease and full purchase</td>
<td>• Lease</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Repair costs due to traffic accidents</td>
<td>• Repair costs due to traffic accidents</td>
</tr>
</tbody>
</table>


6 Discussion

The following chapter contains a discussion in regard to the empirical study.

6.1 Value Creation

The results of this study suggest that there is a potential for an increased total value to be created from off-peak deliveries. In case 1, it is clear that an increased value is created already at this early stage. The total value in case 2 is not as clear; there is an increased delivery reliability which is valuable for the stakeholders, and there is an increased utilization of the truck, but the increased transport efficiency does not result in savings because of the low delivery volume. However, the results indicate that there is potential for a significant increased value if the delivered volumes increase. The most significant added values for the supply chain as a whole are created from the increased transport efficiency, the increased delivery reliability and the increased utilization of the trucks. For some of the individual actors, the market positioning is also a very important aspect. This does not necessarily add to the supply chain surplus, but definitely increases the incentives for each actor to shift to off-peak deliveries. The created value is summarized in Figure 12.

<table>
<thead>
<tr>
<th>Increased Transport Efficiency (with direct impact on off-peak deliveries)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Increased driving speed</td>
</tr>
<tr>
<td>• Larger delivery window</td>
</tr>
<tr>
<td>• Increased accessibility to loading zones creates time savings</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Increased Delivery Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Improved reliability</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Improved Utilization of the Trucks</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Both night shift and day shift</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Improved Market Positioning</th>
</tr>
</thead>
</table>

Figure 12. Created value from off-peak deliveries

For the aforementioned values to be realized, the nature of the business and the internal processes showed to be imperative. At the receivers’ end, the fact that off-peak deliveries do not disturb or force a radical change in daily operations was identified as a common success factor. For instance, the deliveries could in all cases be moved to off-peak hours without having to increase staff hours, which otherwise would have led to added costs. This was achieved through utilizing staff that are already present at these hours, or through completely unassisted deliveries. Unassisted deliveries proved to be essential to the success of off-peak deliveries in the case of the grocery chain, where the possibility to disperse deliveries over the course of the whole night led to direct savings from reduced staff costs. Many other important factors identified as reasons for the greater value created in case 1 had to do with the organizational and ownership structures of the actors, as well as their operational strategy and processes. Since the grocery chain owns all of its own stores and central warehousing, all savings that are created will be a direct benefit to one actor. Also, with the roles of both shipper and receiver in this part of the chain, they hold much of the decision power. The centralized ownership makes the savings significant for the actor with most decision power, which together with the centralized decision-making makes the shift much easier to make, compared to many small actors with less clear savings and scattered decision-making. Therefore, it was easier for the grocery chain to shift a large delivery volume to off-peak hours, thus creating a substantial
increase in transport efficiency. Although these characteristics make the shift more likely to occur, they are not necessarily reasons for the added value to be realized in the supply chain as a whole.

Instead, one of the main identified contributors to the realization of the savings for the grocery chain was the volume of deliveries that were instantly available. The grocery chain could utilize the off-peak permission for the hybrid truck and deliver goods to three inner city stores, that all required a full truckload of goods, in one shift. This meant that, firstly, the entire shift was utilized fully. Secondly, since the whole truckload was unloaded at only one delivery point before the truck went back to the warehouse, the truck spent a larger percentage of the time on the highway than the truck in case 2. According to Li’s (2015) findings, the time gain from reduced traffic is greater on the highway, going into or out of the city, than inside the inner city. This means that the total efficiency gain could be greater in case 1 due to the relatively large percentage of time spent on the highway. Additionally, the fact that the grocery chain’s normal procedure is to deliver during the night to all of its stores outside the city contributed to the planning of routes being as efficient as possible. Naturally, this fact also reduced the implementation costs, as the inner city stores were rather an exception with need of special treatment before this project.

As discussed earlier, the unassisted deliveries were another important contributor to the possibility of making significant savings, as they facilitated dispersed deliveries without causing extra costs. The process of handling the goods at the stores, where the staff would have to wait for the deliveries to stock the shelves in the store, was considered to be an additional contributor. This meant that the staff hours could be significantly reduced when the deliveries were completed before the start of the business day. In case 2, many of these contributors are lacking or less distinct. The volume of deliveries is significantly smaller, which reduces the possibility to utilize the truck in the most efficient way. The processes of handling the goods at the receivers vary, but generally they do not result in reduced staff hours to the same extent as in case 1. These differences are considered to be the main reasons why there is a greater total value created in case 1 compared to case 2 at this stage. However, there is potential for this to change and thereby create more value in case 2, for instance if the volume increases.

Looking outside the specific part of the supply chain that is included in this study, there could also be benefits for other stakeholders with off-peak deliveries. Further downstream in the chain, the end consumers can benefit from increased availability of goods etc., which could add to the total value. At the societal level, there can also be benefits. If more deliveries were to take place at nighttime, fewer trucks would drive during peak hours contributing to traffic congestion. More efficient deliveries could also lead to reducing emissions, and if this were to promote the use of environmentally friendly trucks it could lead to an even more sustainable distribution system.

6.2 Value Proposition

The value proposition offered by the studied actors does not change with the offering of off-peak deliveries. However, the value proposition is significantly improved when the offered service brings an increased value for the customer. With increased delivery reliability, the delivery of goods comes with a greater value for the receivers. And with increased efficiency, the service of performing these deliveries gives a greater value to the transport buyer.

At an initial stage of off-peak deliveries, a value proposition of high quality and sustainable urban transport services is one that will benefit most from this offering. Customers who value delivery reliability and can perhaps create savings as a result of more reliable deliveries are
likely to experience increased value from off-peak deliveries. Value propositions focused on low costs could be less likely to gain from this, since there is a need for large investments and the costs are high due to more expensive trucks and salary costs, which in turn will make it even more critical to have a logistical setup that enables savings from increased transport efficiency and delivery reliability. However, with enough delivery volume, the efficiency gain should drive down the costs.

6.3 Value Capturing

Even if an increased value is created, it is also important how this value is distributed and who, in the end, that benefits. This affects the incentives for each actor to make the shift to off-peak deliveries. If the incentives are not enough for the actors with the most decision power, the shift is unlikely to occur. According to both previous findings and the results of this study, the receivers have the most decision power in this kind of supply chain, followed by the shippers. This means that the incentives for these actors need to be significant enough to make off-peak deliveries realistic. This power relationship also affects the pricing models used, which in turn determine the distribution of costs and profits, and thereby the incentives.

As mentioned before, the largest added values to the supply chain are the increased efficiency, improved delivery reliability, and increased utilization of trucks. Even though these values are improvements to the value propositions, the suppliers who offer these value propositions rarely capture the added values of them. The increased delivery reliability is an improved value proposition toward the receivers, but this value is not captured by the wholesaler. Furthermore, the increased transport efficiency is an improved value proposition toward the transport buyer, but the value is not captured by the carrier. This is a result of the power relationship between the actors. However, there can be other benefits for the suppliers, which justify not capturing the value of the improved value proposition. For instance, improving the value proposition without charging extra for it increases customer satisfaction, and in a competitive business with low switching costs for the customers, this is important in order to keep them. Naturally, this could also bring in new customers who value the improved value proposition. For the wholesaler, not charging for the increased value can also be justified by the potential to achieve savings from the increased efficiency. However, another improved value offered to the receivers is the increased service level from the drivers, which is also not captured by the wholesaler, and this is something that can counteract the benefits from reduced traffic and thereby reduce the efficiency gain.

The power relationship and the competitive situation are probably part of the reasons behind the pricing models used in these relationships. Charging for deliveries, for example, could hurt the customer satisfaction with the wholesaler, since receivers are so reluctant to pay for deliveries. The importance of customer satisfaction is also very evident by the resources that are spent on keeping the delivery reliability relatively high and meeting customer demands of delivery times. The short window of time together with unpredictable traffic makes this very difficult during the normal daytime deliveries, and yet the wholesaler works hard to meet these demands. Naturally, the costs of this are transferred to customers, but the pricing model used fails to send clear price signals to receivers of how costly their deliveries are. Additionally, the added value of off-peak deliveries is reduced when the delivery reliability is kept relatively high during the day, for example by sometimes adding extra trucks for the deliveries, which is costly. Without charging for deliveries, this difference is invisible to the receivers. In an integrated chain, like in the case of the grocery chain, the difference becomes apparent since the costs of keeping high delivery reliability and the benefits from it arise for the same actor. If the pricing model reflected the costs in case 2, the most cost efficient solution could appear in a similar,
natural way. However, as mentioned before, charging for deliveries could affect the customer satisfaction negatively and a change is therefore considered unlikely to occur in this case.

Another aspect that hinders the value capturing for some of the stakeholders is the inability to measure the values that are created. As discussed within the theoretical framework in section 3.2, profit sharing methods will be more difficult to use when there is not a clear view of what values to measure and how to measure them, according to Kindström (2010). If the carrier could be able to quantify more of its savings from off-peak deliveries, then the shipper in case 2 would not have to cover all of the carrier’s costs, which would lead to a better business case for the shipper until the delivered volume has increased. When the delivered volume increases, there will be less of a need to lower the costs for the shipper since this stakeholder would be able to obtain savings from the increased transport efficiency. According to Töytäri et al. (2015), uncertainty regarding the value creation and an uneven bargaining position will prevent profit sharing. The unusual aspect in this case is that the shipper agreed to the terms of the carrier by paying for 8 hours even though the deliveries needed 4-5 hours, even though the shipper has more negotiating power. Usually it is the supplier that fails to capture more of the created value (Töytäri et al., 2015). However, without this pricing agreement, a shift to off-peak deliveries would not have been possible since the carrier would not have been able to cover its investment. Given the exception to the ban on nightly deliveries with heavy haulage that was created by the City of Stockholm, this provides the carrier with a certain exclusivity in offering off-peak deliveries, which also increases the negotiating power of the carrier.

### 6.4 Comparing results with previous off-peak trials

As mentioned in section 4.1, the previous studies of off-peak deliveries in for example New York focus on the carrier being able to obtain enough savings to be able to provide a discount to the receivers that agree to use off-peak deliveries. According to Holguín-Veras et al. (2014), the carrier benefits from the increased driving speed and other productivity gains such as more accessible loading zones. This focus constitutes the largest difference between the previous studies of off-peak and the case study of off-peak deliveries in Stockholm, since this investigation has showed that it is the shipper that receives most of the savings from the increased transport efficiency due to pricing model used.

Similar to previous studies, there are clear benefits of having an integrated supply chain since all the savings are obtained by the same company, which make it easier to make a cost-benefit analysis and complicated profit sharing between more or less adversarial businesses can be avoided. This increases the chances of being able to switch to off-peak deliveries and taking advantage of the savings that arise. However, in case 1 it is not an integrated carrier-receiver operation, but rather an integrated shipper-receiver operation. As stated above, the shipper can obtain significant savings from off-peak deliveries, and due to the integrated shipper-receiver operation, these savings and the added costs for the receiver are obtained by the same company; thus making it easier to create a complete sharing of profits and costs.

The lack of willingness of the receivers to switch to off-peak deliveries that has been observed by the studies of off-peak trials in other cities has also been observed in this study. Although, this investigation has focused on the pricing model between the shipper and the receivers which, due to the low transparency of the pricing, fails to provide a price signal that can direct the customers towards the most efficient transport solution. The shipper’s costs of having to, occasionally, use extra trucks during the morning hours to keep the reliability at a high level do not impact the receivers; hence they are unwilling to change to other delivery hours. In New York, they have tackled this problem by providing the receivers with subsidies to accept...
deliveries during off-peak hours. As mentioned in section 4.2, this will probably not become the case in Stockholm which is why this investigation focused on other aspects instead.

6.5 Limitations of the study

The limitations of a short time frame as well as restricted access to information has resulted in some compromises having to be made that may have a negative impact on the reliability and generalizability of the results of this study. Studying many different actors without access to all relevant internal information has required information to be provided by the interview subjects, and therefore the results have been based on the personal conceptions of these subjects. The small scale of the pilot project and the case in study has also limited the sample to a very small number of interview subjects, which has made it difficult to verify the results. The views of a few people have had a rather large impact on the results presented. The fact that all actors in the study have an interdependent relationship within the supply chain, might also affect the views and information shared during interviews. It is also possible that the studied actors have been more inclined to focus on the positive sides of off-peak deliveries rather than costs and drawbacks.
7 Conclusion

This chapter provides a summary of the answers to the research questions.

How is Value Created from Off-Peak Deliveries and How is This Value Captured and Distributed Between the Stakeholders?

Off-peak deliveries create value for the stakeholders in the form of increased transport efficiency, improved delivery reliability and increased utilization of the trucks. The improved market positioning is also an important advantage of off-peak deliveries but the value is not easily defined and quantifiable.

The different requirements and operations of the stores, restaurants and hotels have a large impact on the value creation from off-peak deliveries and determine how the value is perceived. Companies that need to receive deliveries during a short time period in the morning will benefit more from off-peak deliveries compared to companies that can receive deliveries throughout the day. When the delivery reliability is highly prioritized, off-peak deliveries will also prove greatly beneficial. At this point, off-peak deliveries contribute to an improved reliability but the value of the increased transport efficiency is more dependent on the individual processes and resources of the stakeholders, and is highly affected by the delivered volume; when only achieving smaller volumes, the value from the transport efficiency is counteracted by higher costs.

Due to the pricing model, the actor that offers the improvement rarely captures the value of the improvement; instead the value is often transferred to the customer. For instance, the value proposition from the carrier to the grocery store in regard to off-peak deliveries include an increased transport efficiency, yet the pricing model of paying per truck shift combined with the increased efficiency results in fewer truck shifts needed by the stores. However, all of the increased costs of off-peak deliveries for the carrier are transferred to the grocery store; hence the distribution of profits and costs is fair in this case.

The amount of volume that can be delivered during off-peak hours will also have a large impact on the value capturing. The low volume of delivered goods during off-peak hour within case 2 has also resulted in a pricing model that has a large impact on the value capturing. Since the wholesaler pays for more hours than needed to deliver the goods, all of the value created from the efficiency gain is not captured. Furthermore, the improved availability of loading zones during off-peak hours, which improves the transport efficiency, does not have a financial impact for the carrier since there is no longer a risk of working overtime when the wholesaler pays for more hours than needed, as mentioned above.

Within case 2, the carrier also transfers all of the costs to the wholesaler, even though off-peak deliveries do not create any savings for the wholesaler at this point. Furthermore, the wholesaler does not charge its customer for off-peak deliveries, despite the increased quality of deliveries that is provided; hence the distribution of profits and costs are not as even as in case 1. In general, the transparency of the pricing will affect the ability to capture value from off-peak deliveries. Even though the reliability of off-peak deliveries is superior to the daily deliveries, the wholesaler does manage to achieve a sufficient reliability for the daily deliveries, but accomplishes this at a high cost, for example by adding extra trucks. By not adding the cost of transportation as a separate expense for customers, the wholesaler is unable to send price signals to its customers. This creates barriers both in regard to charging for the improved quality of off-peak deliveries, and in regard to steering the customer towards the most efficient solution. However, using a more transparent pricing model with an individually set transportation price would, in the long run, benefit the most efficient transport solution.
What are the Key Factors That Enable the Stakeholders to Profit from Off-Peak Deliveries?

At the receivers’ end, the fact that off-peak deliveries do not disturb or force a radical change in daily operations was identified as a common success factor. Using personnel already available to receive deliveries or the possibility to use unassisted deliveries was important in order to avoid incurring extra costs that would counteract the savings and benefits from off-peak deliveries.

Sufficient volume of goods to deliver is important in order to create savings from increased efficiency. One of the main identified contributors to the realization of the savings for the grocery chain was the volume of deliveries that were instantly available. The large volume made it possible to utilize the truck for a whole shift, which together with the increased efficiency enables savings.

Increased utilization of trucks is another contributor to increased value. In case 2 it was the utilization of the truck that was a key factor in the value creation. Being able to use the truck for multiple shifts per day makes it possible to increase earnings per truck.

A centralized owner structure will facilitate the decision and can allow sufficient volume to be available immediately, which allows for savings to created. With savings and costs concentrated at one point, the possibility to benefit from a shift becomes apparent and thereby a shift is more likely to occur.

For a non-integrated supply chain, volumes are likely to be insufficient at the initial stage. In that case it is important with an actor with a long-term perspective and willingness to invest in new opportunities, in order to get it started.

Which Factors Will Allow More Value to be Created and Captured from Off-Peak Deliveries?

The potential to use off-peak deliveries for marketing purposes is generally unexploited. To advertise the use of sustainable transport solutions is a possibility for positive attention, which could attract customers and thereby create more value.

In one of the cases the truck is only used at night and thereby not utilized fully. Using the truck for a dayshift as well would increase the value.

Increased delivery volume would generate significantly more value in case 2. The volume in case 1 is currently limited by the scope of the pilot project, but if more inner-city stores could be included, the volume could increase and create even more value in this case.

The selling of off-peak deliveries is also limited by the temporary permit. If and when the permission is permanent, suppliers do not have the risk of selling something they would later have to take back and risk customer dissatisfaction. This can enable getting more receivers to participate and thereby increase volume.

7.1 Suggestions for Future Research

The aim of this thesis was to gain in-depth understanding of the phenomenon of off-peak deliveries. Therefore, only one case has been studied very thoroughly. This has given some
useful insights about the possibilities to increase value in a supply chain through off-peak deliveries. However, in order to draw more generalizable conclusions about this, more cases need to be studied. When there is more research readily available on the actual efficiency gain from driving and delivering at night compared to during the day, more general business cases can be presented. It is also important to be able to measure and quantify the savings and costs that have been discussed in this study, in order to present reliable business cases. Since getting receivers to participate is crucial for the success of off-peak deliveries, more research about possible ways to increase the incentives for them would be useful. It would also be interesting to study other industries than the food industry to find if there are other factors that affect the value created and which industries that are most suitable for off-peak deliveries.
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Appendix A: Interview Guides

The questions below posed as a basis for discussion during the interviews. The questions were adapted slightly depending on the interview subject, and many more questions were asked based on the subjects’ answers.

Value proposition

What is your value proposition toward your customers?

How does off-peak deliveries improve your value proposition toward your customers?

Value Capturing

What pricing model do you use toward your customers? How do you charge for deliveries?

What pricing model is used for off-peak deliveries?

What pricing model does your supplier use toward you?

What pricing model is used by your supplier for off-peak deliveries?

Why are these pricing models used? How well do they work with changes such as the shift to off-peak deliveries?

What kind of savings do you obtain from off-peak deliveries?

What kind of costs do you incur from off-peak deliveries?

What kind of savings and costs do your supplier/customer obtain from off-peak deliveries?

Can you use pricing as a way to create incentives for your customers to shift to off-peak deliveries?

Value Creation

What processes and resources are affected by the shift to off-peak deliveries?

Are there any new resources or processes necessary because of the shift to off-peak deliveries?

Do any existing resources or processes gain importance with a shift to off-peak deliveries?

Do any existing resources or processes gain importance with a shift to off-peak deliveries?

Are there any processes or resources that are not compatible with a shift to off-peak deliveries?