CHALMERS

Drivers, consequences and actions for reverse logistics within the aftermarket

A case study of Volvo Group

Master's thesis in the Master's Program Supply Chain Management

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CHALMERS UNIVERSITY OF TECHNOLOGY
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ABSTRACT
Companies in the automotive industry cannot neglect the growing importance of the aftermarket as it is one of their main sources of profit. For automotive companies like the analyzed case company, the uptime of the vehicles is of the utmost importance for their customers, and balancing high availability of parts at the right cost is crucial. As the customer demand in the automotive aftermarket is highly stochastic and difficult to foresee, it is almost inevitable to avoid returns and the need for reverse logistics. However, the area of reverse logistics is generally not highly prioritized among industrial companies.

Therefore the purpose of the thesis was to find and analyze underlying mechanisms that drive returns and its consequences that it has on the studied case company. This was done in order to find and target appropriate actions towards increasing the control of the reverse flow and reducing the amount of returns. To fulfill the purpose, data was collected from multiple sources; semi-structured interviews, internal documents, workshops and direct observations. The thesis focused on two return categories that contributed to the largest share of returns. It was identified that the current situation had not been evaluated before and that the return rate was higher than expected. It was also found that there were large variations in terms of return volumes both on national level and between dealers operating in the same country. When investigating the Swedish market more thoroughly and comparing the empirical findings with the theory, five drivers of reverse logistics were identified. These were *Replenishment setup and performance, Key performance indicators, Return policies, Aftermarket context and return processes* and *Dealer behavior and planning capabilities*. The underlying mechanisms of each driver were then analyzed in order to find appropriate actions. Key actions that the authors found were *Improve delivery precision, Change return allowance parameters, Introduce returns vs. sales KPI* and *Increase communication and collaboration.*

The presented result of the thesis contributed to an understanding of the current return situation and actions that could be implemented to reduce the amount of returns. Moreover, the result gave valuable insight to the fact that returns could have the same drivers, but the underlying mechanisms and who owns the process to improve it can differ. The result also contributed with a logic that could be used to reduce the amount of returns further within the case company, in similar companies and in other industries.

Keywords: closed-loop supply chain, reverse logistics, automotive aftermarket, spare parts management, drivers, consequences and actions

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Several people have contributed to the progress of this thesis, but we would like to take this opportunity to direct extra gratitude to our two supervisors at VTC/VBC and Chalmers University of Technology. Fredrik Engblom, our supervisor at VTC/VBC and director for Logistics Services planning. Without your drive, energy and expertise this thesis would not have been close to reaching the same result as it did and the authors would not have gained as much experience without your knowledge and participation. Arni Halldorsson, our supervisor at Chalmers University of Technology and professor in Technology Management and Economics. Your expertise and enthusiasms within the subject of reverse logistics has been crucial for the result of the thesis and the developed logic, that is the foundation of the thesis, had not been possible to reach without your help.

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Finally, we would also, of course, like to thank all the other employees at VTC/VBC that participated in the interviews and workshops for all the input and information that you gave us. We would also like to thank all of you for making our time at Volvo Group exciting and fun and we hope to see you in the future.

Gothenburg, 2016

Arvid Petersen and Jonas Sagström

LIST OF ABBREVIATIONS

SCM - Supply Chain Management
CLSC - Closed-Loop Supply Chain
VTC/VBC - Volvo Truck Company and Volvo Bus Company
LS - Logistic Services
MM - Materials Management
DIM - Dealer Inventory Management
KPI - Key Performance Indicator

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1 INTRODUCTION

In this chapter the reader will be introduced to the thesis. First, a background to RL and its growing importance both in general and at VTC/VBC is presented. This is followed by a problem description and reasons why the thesis was performed. The purpose of thesis and the research questions is then presented and lastly, the scope and the outline of the thesis are described.

1.1 Background

The focus within supply chain management has moved from the forward flow to a holistic view of the whole supply chain, where closed-loop supply chains have gained increasing attention (Guide & Van Wassenhove, 2009; Blackburn *et al*., 2004). Closed-loop supply chains imply that used products are brought back from customers through a RL system in order to capture value by e.g. reusing or remanufacturing products (Richey *et al*., 2004; Vachon *et al.,* 2014; Mollenkopft, 2010). In 2010, it was found that U.S companies spend over $100 billion annually on product returns, which caused an average profit loss of 3.8 percent (Petersen & Kumar, 2010). In 2013, it was seen in the U.S that RL activities accounted for 4.5 percent of all logistics costs (Hall *et al*., 2013).

Understanding the differences between the forward and reverse supply chains is of high importance, however this is not realized in many contexts and industries (Vachon *et al.,* 2014). This is further complicated by the fact that there are many types of returns and customers tend to return products differently during its product-life-cycle e.g. generous return policies allowing the customer to return the product for any reason within a certain period of time (Guide *et al.,* 2003). Moreover, in a traditional manufacturing supply chain the demand is more predictable with 15-20 times less stock keeping units (SKUs) than in an aftermarket supply chain. Therefore, the aftermarket is highly complex to manage where companies face the challenge of handling large amounts of returns (Cohen *et al.,* 2006).

Furthermore, the importance of the aftermarket within the automotive industry has during recent years increased as it has been shown that the aftermarket could generate three times the turnover of the original purchase during the product's lifecycle (Saccani *et al.*, 2007; Gaiardelli *et al*., 2006). Therefore, companies in the automotive aftermarket needs to consider the reverse flow as it needs to handle returns as a consequence of e.g. defective parts, incorrect shipments, overstocks and the stochastic factors affecting the aftermarket (Cohen *et al.,* 2006; Wagner *et al.* 2013). It was shown by Inmar Reverse Logistics (2009) that automotive companies has an average return rate of 9,7 percent of total sales in the aftermarket and companies not actively working with RL could lose 35 percent of their net profit. Hence it is imperative to not neglect the importance of RL for companies operating in the automotive aftermarket.

Volvo Group is one of the largest manufacturers of trucks, buses, construction machines and marine and industry engines in the world. With around 100 000 employees, the group is present in more than 190 countries with production in 19. In 2015, Volvo Group had a turnover of 283 BSEK and a profit of 6 BSEK where a large share of the profit came from aftermarket. In each division, Volvo Group consists of several brands within different industries, e.g. VTC/VBC, Renault Trucks, Volvo

Construction Equipment and Shandong Lingong construction equipment. This thesis will focus on VTC/VBC, which are sold and repaired through a network of 650 dealers and 1450 repair shops spread out over the globe.

The overall goal for Volvo Group and VTC/VBC within the aftermarket is to "...ensure global availability of aftermarket parts to dealers and end customers at the right time, the right place and at the right cost" (Volvo Group, 2015d). However, by promising high availability at the dealerships in a complex environment as the aftermarket it becomes inevitable to avoid returns. It was shown that VTC/VBC suffers from large return flows, which indicated that the reverse flow needed further attention. The return volumes and the costs associated with this flow had not yet been explored and the connection between if the current return situation increased the promised availability had not yet been evaluated.

1.2 Problem description and challenges

The focus within VTC/VBC has been on the forward flow of spare parts where VTC/VBC has an advanced and complex system to handle the outbound flow of spare parts. The return flow of spare parts has however gained much less attention and currently no one is taking on the responsibility for the returns. One reason for this is that the reverse flow is quite complex and spans over various departments and organizational boundaries. It also spans beyond VTC/VBC's internal processes since external actors, such as the dealers, also affects them.

As stated before, one of the most important aspects for VTC/VBC is to offer a high availability at the right cost in the aftermarket. Currently, VTC/VBC is steering the replenishment of parts for the aftermarket centrally through the DIM concept, where VTC/VBC controls the main part of the dealers' inventories. As VTC/VBC wants to secure a high service level towards the end customer, the company takes the risk of pushing too many spare parts out to the dealer. Therefore VTC/VBC offers to buy back products that are not sold in order to keep healthy stock levels at the dealerships, which causes a high amount of returns. Moreover, the dealers are able to place manual orders to ensure that parts that are not replenished through the DIM concept, due to e.g. high product value or low sales frequency, are available when the demand arise. The dealers are then able to return these parts if they are remained unsold, for full compensation, to ensure that dealers do not hesitate to order spare parts and jeopardize the availability. Moreover, the costs associated with these returns are fully covered by VTC/VBC, e.g. the cost for handling and transporting these products in order to re-insert them in the forward flow. The key issue is that no one has an overview of the situation and what consequences it has on the overall performance for VTC/VBC.

The lack of interest and visibility for the reverse flow further implies that there are no clear goals or visions for this area. The return policies are not harmonized over countries, brands and dealers, where different agreements apply to different dealers. Due the lack of overview of the reverse flow, the policies have never been evaluated or questioned. Dealers tend to use the return options differently, creating very volatile and complex return flows, making it difficult to understand the underlying mechanisms that affect the return behavior. Moreover, the complexity of understanding what drives the returns can further increase by the contextual factors within the automotive aftermarket. The belief is that the return policies are a must in order to secure availability but the negative aspects of it

has not yet been discovered. In addition, no control mechanisms are present for the returns, making it difficult for VTC/VBC to measure and find potential improvements in their reverse flow.

The problem description implies that one of the biggest challenges is to in a structured way find the drivers of RL and its underlying mechanisms in order to provide VTC/VBC with the full picture of the current return situation. Moreover, VTC/VBC needs to understand why returns occur and what consequences it has on the overall performance in order to establish a clear strategy for RL.

1.3 Purpose

The purpose of the thesis was to analyze consequences of returns and to identify drivers of reverse logistics and their underlying mechanisms. This is in order to develop appropriate actions, which can reduce the total amount of returns within VTC/VBC.

1.4 Research questions

To facilitate the process in which the purpose of the paper will be answered, three research questions were formulated. How these questions will be answered and what kind of data collection and method that is chosen for each questions along with expected results is presented in chapter *2.1.1 Research Process*. The research questions and their purpose are stated below:

1. What are the consequences of the current reverse flows within VTC/VBC?

The purpose of research question one is to provide an understanding of the current reverse flow and its consequences. This will be done through mapping the current situation in terms of volumes and cost. This question will also help the authors to identify negative aspects that the return flow has on the overall supply chain. As many departments are involved and affected by the reverse flow while no one has the primary responsibility for the return flow, this question is important both for the authors and VTC/VBC.

2. What are the underlying mechanisms in the current setup that drives returns?

Research question two was formulated to find what underlying mechanisms that are driving the returns. VTC/VBC has shown symptoms of e.g. large return flow and as a consequence, there is a high cost of handling and transporting the returns. It is therefore of interest to investigate the mechanisms that drives these symptoms in order to find sustainable suggestions for improvement.

3. What are the potential actions and how can these reduce the amount of returns?

This question aims to provide VTC/VBC with new guidelines in order to improve their RL. The suggestions will aim to target the underlying mechanisms in order to reduce the returns that create unnecessary costs and issues in the supply chain. The potential outcome of working actively with RL will further be analyzed in the report.

1.5 Scope

Due to the limited time frame, the scope of the thesis had to be limited, which is described in this section.

The fact that Volvo Group owns a lot of different brands makes the organization very complex. Different policies, working procedures and markets make it complicated to draw any conclusions over the brands. Therefore, this study will focus on VTC/VBC, since they are very similar in many aspects. The two brands are often sold and repaired at the same dealers and stands for a large amount of Volvo Group's revenue, which means they can act as internal benchmarks for the other brands. The results could therefore be generalized within the organization even though this report is mainly focused on the two chosen brands.

The focus of the thesis will be to identify the drivers of RL and targeting the actions towards mitigating these, see figure 1. Drivers are defined as areas affecting the number of returns, which creates the need for RL. By just attacking the consequences, the returns will not be reduced in the long term and therefore it is seen more valuable for all stakeholders of the thesis to focus on finding actions aggressing the drivers.

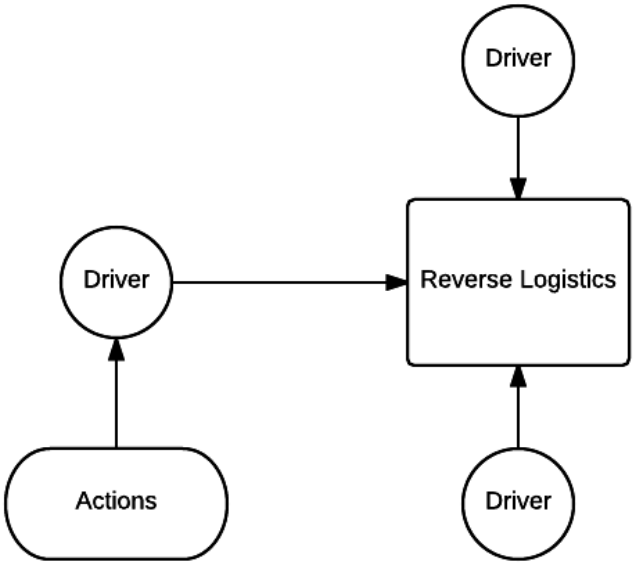

Figure 1. Illustration of where the actions will be focused

Moreover, VTC/VBC has several return flows in their supply chain. This thesis will be focusing on the buyback and "order-by-mistake", illustrated in figure 2.

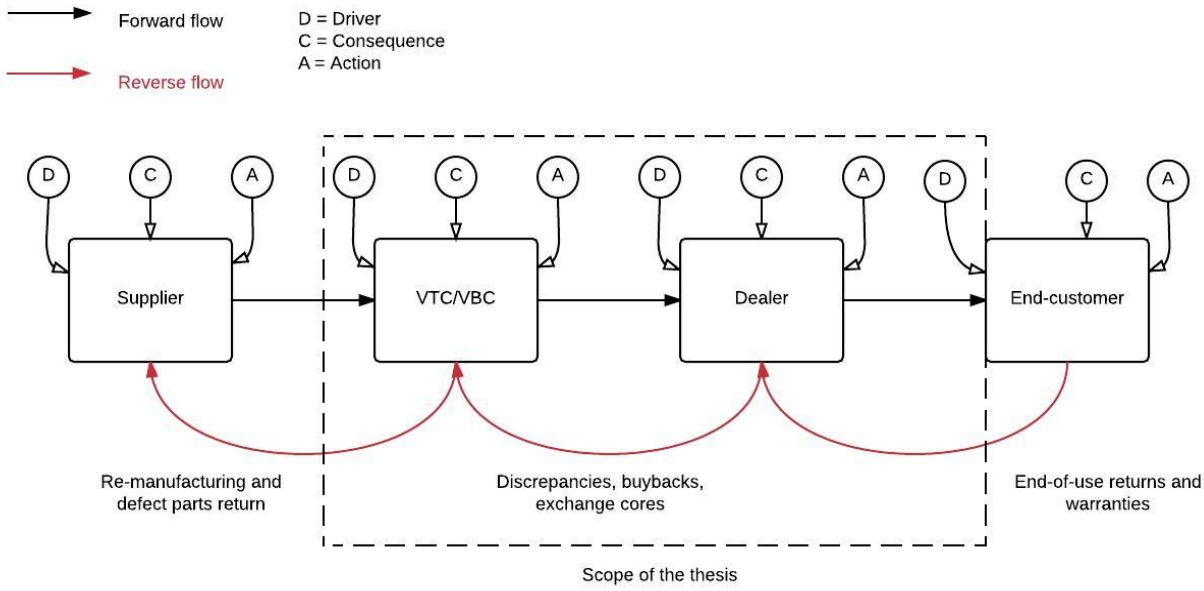

Figure 2. Simplified picture of an aftermarket supply chain

Order-by-mistake returns are a part of the discrepancies returns and this return in combination with the buybacks was chosen since they are the largest contributors to the return volumes in Europe. Order-by-mistake returns are approximately 60 percent of the total value and weight returned whereas the buybacks constituted for approximately 28 percent. Moreover, suppliers and end-customers are outside the scope except from how the end-customer drives the returns. The focus will therefore be on investigating and analyzing drivers, consequences and actions at and between VTC/VBC and dealerships. From a RL perspective the focus is not to optimize the process as such, it is more about understanding drivers and its underlying mechanisms for the chosen return categories and try to minimize the total number of returns. Underlying mechanisms are defined as the components that create the drivers, which eventually create the need for RL.

When comparing regions globally, it became evident that the European market was one of the largest contributors to the return flow. Therefore, the researchers chose to focus on this market where especially Sweden was one of the largest contributors to RL in the world, making it an interesting market to analyze further. Analyzing one country more thoroughly instead of e.g. Europe was proven to be much more effective since data was more accessible and still generalizable for the whole organization. However, the report will aim to map the European reverse flow but many of the suggestions for improvements will derive from a thorough analysis of the Swedish market and its dealers.

1.6 Outline of the thesis

This thesis consists of seven chapters and the outline will be described in this section.

Chapter 2 - Research methodology
In this chapter the methodology is presented that was used to reach the purpose of the thesis. Firstly, the chosen research approach and research design are described and motivated why it was used. Secondly, the methods used for data collection is presented. Thirdly, data analysis and the logic used are explained. Lastly, the chosen research methodology is discussed.

Chapter 3 - Theoretical framework
The chapter is divided into three parts where the first part will aim to describe why RL has become an increasingly important subject within most companies today. The second part of this chapter will further target the challenges and describe some of the underlying factors that drive RL within the aftermarket for the automotive industry. The theoretical findings are then summarized in the third part with purpose of describing the complexity of how multiple factors together can create the need for RL.

Chapter 4 - Empirical findings
The first part of this chapter will introduce the reader to the background of VTC/VBC and their logistic operations, both in the forward and reverse flow, followed by a description of current KPIs and the focused return codes. This is in order to understand the more in-depth information provided in part two where the as-situation for returns and why they occur on a European and Swedish level is explained. In the end of part two challenges within the two focused return categories will be explained. The findings are then summarized and compiled into two frameworks in order to introduce the reader to the key drivers for RL within VTC/VBC.

Chapter 5 - Analysis
In part one of this chapter identified drivers and their underlying mechanisms will be analyzed. In the end of part one a framework will be presented in order to provide the reader and VTC/VBC with an understanding of the complexity of what is driving RL and who owns the process of improving it. By doing so, it will alleviate part two of the analysis were suggested actions towards the underlying mechanisms will be presented. In part three the initial phase of implementing the suggested actions will be analyzed in order for the reader to understand complications that could arise when initiating change at a large organization such as VTC/VBC.

Chapter 6 - Discussion
This chapter will focus on discussing the findings and result of the thesis and how they added value at VTC/VBC. Moreover, the validity and generalizability of the drivers and action will also be discussed. In the end of the chapter future recommendations for VTC/VBC will be presented.

Chapter 7 - Conclusion
This chapter will summarize and highlight the most important findings and aspect of the thesis. This will be performed from a research question perspective, where each research question will be evaluated and important aspects will be highlighted.

2 RESEARCH METHODOLOGY

In this chapter the methodology is presented that was used to reach the purpose of the thesis. Firstly, the chosen research approach and research design are described and motivated why it was used. Secondly, the methods used for data collection is presented. Thirdly, data analysis and the logic used in the thesis are explained. Lastly, the chosen research methodology is discussed.

2.1 Research approach and research design

There are two main research approaches that could be used: a quantitative or a qualitative approach (Yilmaz, 2013). The latter approach involves collecting data through interviews, surveys and observations, whereas the quantitative focuses on numerical data where the data is analyzed through mathematical methods (Yilmaz, 2013). In this report, both of these approaches were used in order to first understand the situation through a qualitative approach. Then quantitative data, e.g. volumes, cost and KPI data was gathered to support the findings in the qualitative data to provide VTC/VBC with valid suggestions for improvements. Bryman and Bell (2011) argues that using a mixed method approach has it downsides, however the use of it has increased and it has become a more accepted approach to use. In this thesis the collection of qualitative was used to create hypotheses that were then tested by the quantitative data and this is according to Bryman and Bell (2011), a good method to use in order to validate the findings. Moreover, the quantitative and qualitative data was used to triangulate the findings, which was seen to increase the validity of the findings and enhancing the suitability of the chosen research approach (Bryman & Bell, 2011).

As both qualitative and quantitative data was gathered and analyzed, Dubois and Gadde (2002) argues that an abductive approach is appropriate since the empirical findings will be compared to the theory iteratively to support the findings and it helped the authors to find new areas to investigate. This is due to that RL is a quite new concept both for the authors and the studied case company and using an abductive approach therefore facilitated the process of understanding it and why RL occurs in the specific context. Moreover, using this approach facilitated the findings of key challenges described in section 2 in chapter *3 Theoretical framework.*

Moreover, Bryman and Bell (2011) discuss the importance of research design and having a framework for the collection and analysis of the data. Bryman and Bell (2011) states that a research design could be conducted in several ways with different strategies and the used research approach depend on the aim of the study. One can define this thesis as an action research as the purpose was to develop the organization and the researchers therefore worked close to the organization. The risk with this design was that the authors could go native, meaning that they come too close to the organization and lose their objectivity. This was taken into consideration by the authors to avoid that this issue affected the end result. Within the research design, several research methods were used. A research method is according to Bryman and Bell (2011) a technique to collect data through e.g. an interview or a survey and the used research methods are presented in chapter *2.2 Data collection.*

2.1.1 Research process

This chapter will describe the overall research process for the thesis. When making an overview of the research process it was easier to validate that the expected outcome of the thesis was reached. The research process was divided into the three different research questions. Answering each research questions was not considered to be isolated activities and during the process the phases overlapped as this was in line with the chosen research approach and design. The research process is visualized in figure 3.

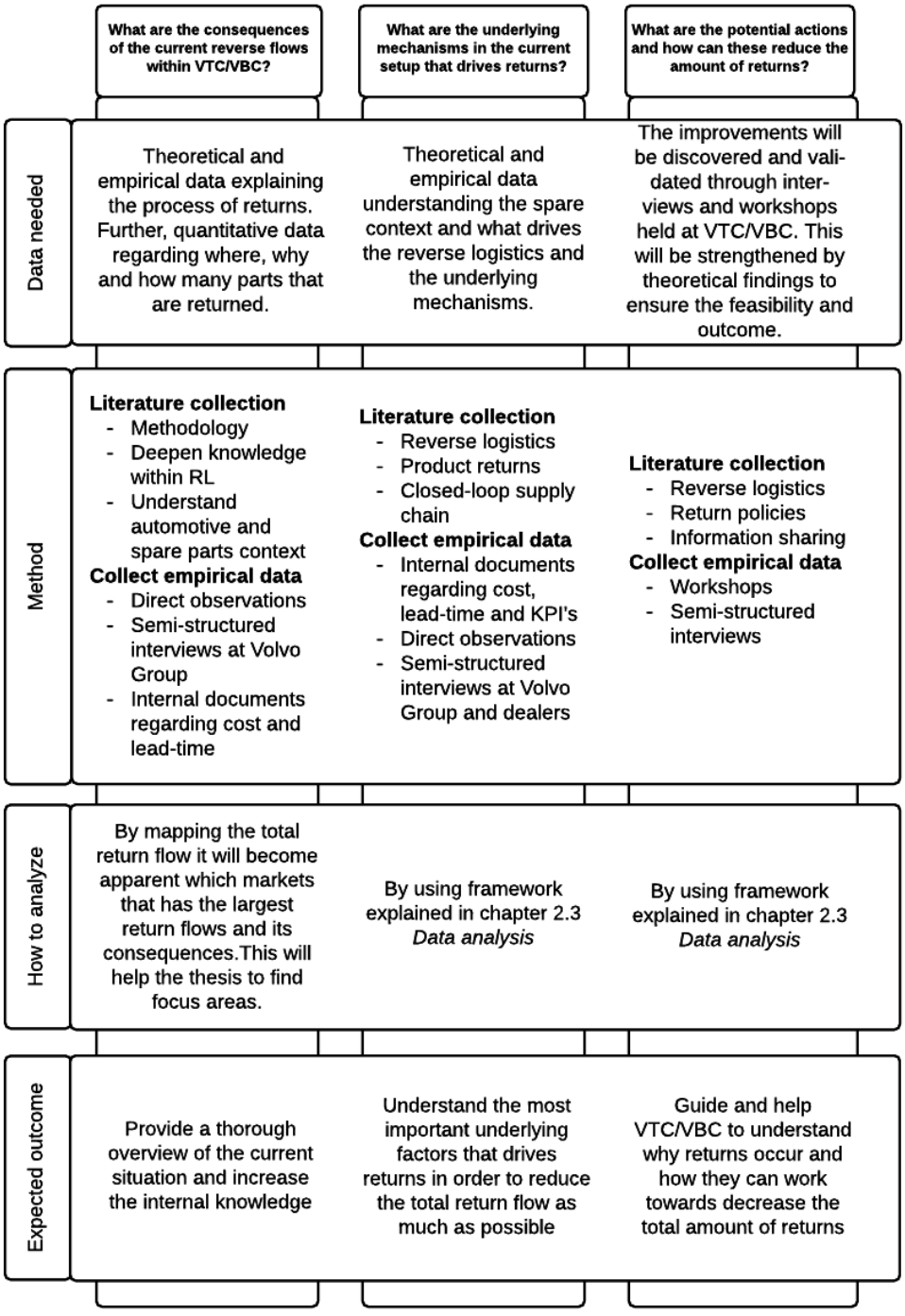

Figure 3. Overview of the research process

During the research process, collecting literature and empirical data was conducted continuously to answer all the research questions. When combining the empirical findings with the theoretical findings Dubois and Gadde (2002) argues that a systematic combining is appropriate, which is in an iterative process where the theoretical findings is continuously confronted with the empirical findings. This iterative process was performed throughout the research process and is supporting the abductive approach chosen for the thesis. Moreover, empirical data was collected from several sources, as this will according to Yin (2009) increase the quality of the collected data. How the data was collected is described more in detail in the following chapter.

2.2 Data collection

Bryman and Bell (2011) states that the authors collect primary data, whereas someone else collects the secondary data. The qualitative data mostly consisted of primary data and the quantitative data predominantly consisted of secondary data. The qualitative data was gathered through literature review, interviews, direct observations and workshops whereas the quantitative data was mainly gathered from internal documents.

2.2.1 Literature review

In order to increase the understanding and gain knowledge about RL, a literature review was conducted. The primary source for the literature study was collected from Chalmers Technology of University's library and their online database Summon at lib.chalmers.se together with Google Scholar. Key search terms for the literature was "closed-loop supply chain", "reverse logistics" and "product returns". In addition, to receive contextual knowledge of these concepts, the key terms were combined with "automotive", "aftermarket" and "spare parts". The literature review was primarily conducted to increase the general knowledge about RL and through this, find challenges that drive the need for RL but it was also used to facilitate the analysis. These findings are compiled in chapter *3 Theoretical Framework* and divided into two parts to increase the understanding of RL and also why it occurs, and the literature review facilitated the process of answering all the research questions.

2.2.2 Interviews

Kvale (2007) argue that using interviews is a powerful method when collecting empirical data as it becomes easier to access the understanding and experience of the interviewee. This is because the interviewee can describe events, experiences and opinions in their own way. In the context of RL an opinion could be why they think it occurs and why it is deemed necessary. Harrell *et al.* (2007) describe three different types of interviews depending on the control level that the interviewer wants to attain: unstructured, semi-structured and structured interviews. For this thesis, semi-structured interviews were conducted in order to allow room for discussion and open-ended answers, which improved the quality of the information obtained from the interviews. A total of 41 interviews were conducted with different persons at different departments and levels within the organization and at different parts of the supply chain in order for the authors to get a holistic perspective of the aftermarket. The interviews were in general one hour but depending on the discussions that emerged, some were shorter and some were longer. Moreover, the semi-structured interviews were chosen due to that it was difficult to use structured interviews and compare answers when the interviewees

worked at different departments and had different degrees of involvement in the return flows, see appendix 1 for interview template. Using unstructured interviews would make it more difficult to find information about the specific return flows that were investigated and therefore, the interviews had to be steered to a certain degree. Hence, semi-structured interviews were deemed to be most appropriate approach.

In the first phase of the research process, information gained from the interviews was to understand how the return flow of spare parts is currently handled. Topics that were frequently discussed were why returns occur and what their purpose is. Moreover, it also helped to guide the authors to look for additional relevant data when mapping the return flow of spare parts as new interesting areas was discovered during the interviews. In the second phase of the research process, interviews was conducted continuously throughout the collection of empirical data as it was deemed necessary to secure that the right information was gained and that the authors was investigating appropriate areas of improvement. In the third phase of the research process the semi-structured interviews was used to validate and confirm the suggested actions.

2.2.3 Internal documents

When the authors gained a broader perspective and understanding of the reverse flow of spare parts, secondary data was gathered through internal documents that helped to deepen their knowledge in certain areas that were in the scope of the report. Internal documents also provided numbers that made it possible for the authors to quantify the reverse flow from a monetary and volume perspective. This made increased the validity of the suggested improvements as the improvements were then quantifiable and the benefit for VTC/VBC was therefore easier to understand. Yin (2009) discusses different types of internal documents; internal records, personal documents, reports about events and mass media e.g. newspapers. The report used internal records and reports about volumes weight and cost etc. between VTC/VBC and their dealers regarding the return flow. When reviewing internal documents, the authors had to consider different aspects to ensure the quality; the credibility and authenticity, the representativeness and the meaning (Yin, 2009). Especially the credibility of the documents was considered as several documents showed different information regarding the same issue. This caused problems to secure that the authors were looking at the right information but after cross-referencing additional documents, a trustworthy source of information was found and used throughout the process. The internal documents for the reverse flow volumes was provided by the financial department at VTC/VBC and were deemed credible due to the cross-referencing from other sources such as data gathered from the different distribution centers within VTC/VBC. Documents received from external actors such as transport suppliers were not deemed credible enough as they showed different information depending on which supplier it were. Internal documents such as cost, lead-time and quantity for the return flows were imperative to answer research question one as the cost of return flow were an important consequence to consider. This facilitated the process of finding focus areas where consequences of the reverse flow was discovered.

2.2.4 Direct observations

Bryman and Bell (2011) argues that direct observations facilitate the understanding of people's behavior and the situation compared to other research instruments e.g. questionnaires. There are different types of observations: Structured, systematic, participant, nonparticipant, unstructured and

simple observations. The authors used a participative observation, as it was deemed to be the most appropriate approach and according to Bryman and Bell (2011) it is also the most common way of collecting qualitative data. Furthermore, Bryman and Bell (2011) highlights the importance of preparing the observation and setting up rules and guidelines. This was highly emphasized by the authors in order to gain as much and relevant information as possible. Direct observations were performed internally at VTC/VBC to understand the processes of administering returns. Direct observations were also performed at chosen dealerships in Sweden to see how they physically handled returns and how they planned and prepared for it. Which dealers that were chosen were depending on their size and how much they sent in return in order to compare similarities and differences between them. During the observations the authors took notes and also made sure that the people that were participating during the observations could be contacted again if new questions arose. Direct observation facilitated the answering of research question one as it helped identifying some of the consequences. Moreover, when physically observing how dealerships worked with returns, some of the drivers and actions that were part of answering research question two and three was discovered.

2.2.5 Workshop

In order to validate both the compiled data and suggested improvements, two workshops were held at VTC/VBC at the department LS where the thesis was performed. The workshops were also used to get additional input to more improvements that could reduce the amount of returns. These workshops were held in the later stage of the process in order for the authors to give the attendances a thorough overview of the current situation.

The first workshop was held 4th of April and 10 persons from the upper management at LS attended. The main purpose of the workshop was to create awareness of the current situation, as there was a general lack of insight in the return flows. Moreover, consequences of the current situation were highlighted in order for everyone to understand what large amount of returns could lead to. By discussing the current situation and the authors' findings, data used to support the findings was validated and findings that were considered vague were removed.

The second workshop was held 9th of May and 6 persons from the upper management at LS attended. The main purpose of this workshop was to discuss the different drivers and their underlying mechanisms and proper actions to reduce them. The authors presented the underlying mechanisms first to discuss them, and then the attendances had the chance to discuss proper actions. When this was done the authors showed their suggested actions in order to validate them and see if they were similar. When everyone agreed on appropriate actions, the complexity and impact of the actions was discussed. This was done through a vote where the attendances could rank the actions on a scale 1-10 from a complexity and impact perspective. The ranking was performed in order to make sure that the right actions were prioritized. This workshop led to an additional validation of the findings, which enhanced the value of the thesis for VTC/VBC. The findings from this workshop are analyzed in part two and three of the analysis.

2.3 Data analysis

In the section the process of analyzing the collected data will be described.

2.3.1 Qualitative data analysis

This chapter will describe the process of analyzing the collected data. In this thesis the analysis and collection of qualitative data was conducted in parallel, which is according to Bryman and Bell (2011) a common way of working when analyzing qualitative data. The main source for qualitative data for this thesis was the interviews and during these, the authors took notes, which were then compiled in a document. New questions and areas that were interesting to investigate arose during the interviews and the questions for the interviews was therefore continuously adapted or excluded. The interviews also made the authors understand which employees that needed to be interviewed depending on department and hierarchal level. The analysis was then conducted by comparing the collected qualitative data with the literature in order to find gaps and areas that needed more attention as the authors used a systematic combining approach discussed by Dubois and Gadde (2002).

The analysis of direct observations was conducted in a similar way as the interviews. After each visit, the authors' observations were summarized in a document and an analysis of the findings was conducted simultaneously. As the authors gained more knowledge after each observation, it became easier to improve the observation method, as the authors knew more in detail what to look for. To understand what drives the RL, the basic thinking of the A3 improvement logic was used, see figure 4.

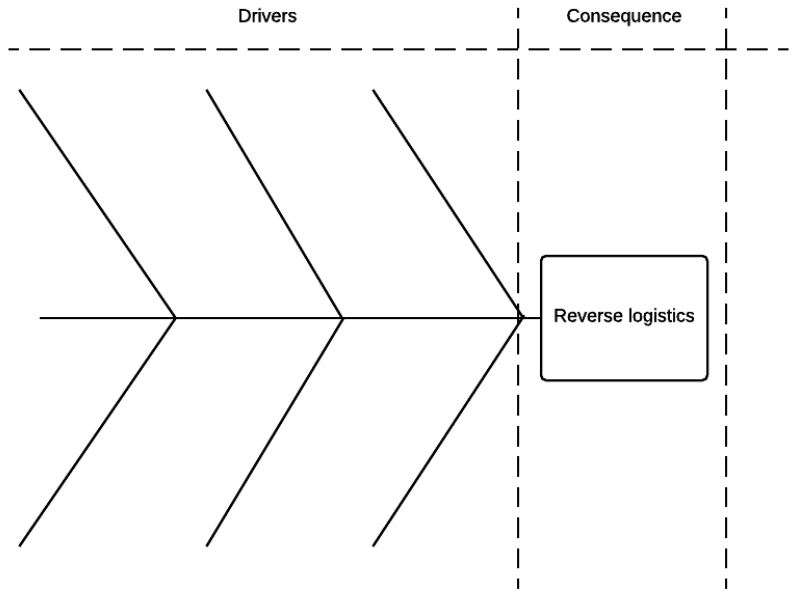

Figure 4. Simplified illustration of the analysis framework (adapted from Desai *et al.*, 2015)

This logic was used as it is a widely used logic in industries and it was deemed easily adapted to the context of the report in order to facilitate the data analysis. This helped the authors to understand what factors that affect the amount of returns, as the focus of the analysis was to identify the key drivers of RL within VTC/VBC.

2.3.2 Quantitative data analysis

The analysis of the quantitative data was moreover done through internal documents. The reason for analyzing this data was to map and understand the current situation and also look for correlating factors to come up with potential improvements. The method used to analyze this data was the data correlation method discussed by Collis and Hussey (2014), which means that the different data variables and input used in this thesis has been tested towards each other to see if there is any relationship between the data. To map the current situation, financial data was used to compare return patterns both on a country level based on European countries and on a dealer level within Sweden. To understand the behavior and return patterns at dealer level, KPI data was analyzed in combination with the financial data to find correlating factors. When analyzing the quantitative data, the drivers found through the qualitative data collection were tested to see if there was any connection. The drivers supported by the quantitative data then became the focused drivers in the thesis. This mindset was the foundation for the A3 framework used in the analysis and this framework was continuously developed throughout the process. In addition, this way of working was seen to be more effective and beneficial for VTC/VBC in the long-term.

2.4 Trustworthiness of the methodology

In order to evaluate the trustworthiness of a study Bryman and Bell (2011) argues that validity and reliability needs to be considered. Lastly, the ethical considerations of the thesis and methodology discussion are provided.

2.4.1 Validity of the methodology

According to Bryman and Bell (2011) validity of the thesis is if the thesis presents what it was intended to present. Moreover, there is a distinction between internal and external validity. Internal validity is if the study has a strong correlation with the theoretical ideas developed by the authors and findings that they did, whereas the external validity is if the findings of the report could be generalized (Bryman and Bell, 2011). To strengthen the internal validity observations and the ideas that were developed was frequently discussed with the supervisor at VTC/VBC. Moreover, they were also validated through two workshops where upper management from LS attended. Hence, the internal validity is considered to be high.

Moreover, the external validity is seen to be to be moderate. To increase the external validity the findings were tested on Renault Trucks where it was seen that some of the ideas were applicable and hence seen as generalizable. However, as only two return codes were in focus, it makes it difficult to generalize them to other return codes as they could be handled differently. Moreover, the findings were not tested on any additional brand dealing with other type of vehicle or companies outside the Volvo Group.

2.4.2 Reliability of the methodology

Bryman and Bell (2011) argues that the reliability of a report increases if the outcome of the report would be the same if the researchers did it again. It is difficult to reach a high degree of reliability in a qualitative study according to Bryman and Bell (2011) as the social settings and other circumstances are constantly changing. To increase the reliability of a study, all steps of the process

has to be documented such as why and how the participants of the study were selected, how the data were analyzed and information received during the collection of data (Bryman and Bell, 2011). All these steps were performed by the authors and compiled in different documents in order to secure the reliability of the study. However, all 41 interviews were not recorded but the notes that were taken during these interviews are saved to enhance the reliability.

Furthermore, as most of the qualitative data is based on semi-structured interviews, the discussions that occur during these could be difficult to replicate. However, as the interview template and the position of the interviewees are stated in the thesis, it is seen as possible to reach a similar result when using the same methodology as the thesis. The reliability of the quantitative data was secured by the authors by triangulation and the use of several sources for the data to make sure that the right data was used and that it would be the same outcome if the study was conducted again. Furthermore, the quantitative data was obtained from secondary sources and for a fixed time period, which is unlikely to change as this data is set and has already happened. Hence, the reliability of the quantitative data is seen as higher compared to the qualitative data.

2.4.3 Ethical consideration

For this report, VTC/VBC initiated the project and advertised it on Chalmers Technology University web page. Therefore, VTC/VBC had expectations on the report and its result and this had to be considered by the authors. Furthermore, the interviewees had the option to be anonymous and this was discussed before conducting the interviews. It was seen that the interviewees wanted to be anonymous, however stating their position was not considered a problem. Furthermore, when reviewing the internal documents it was imperative for the authors to know if the information was confidential and to what extent it could be used in the final report. This was highly emphasized both by the authors and VTC/VBC and a lot of financial data is therefore not displayed in the report, but is however shown internally for VTC/VBC.

2.4.4 Discussion of the chosen methodology

There is always a risk with interviews that the interviewees present their own opinion, instead of the company's opinion. There is also a risk that the interviewed or observed employees are reluctant to share problems in the organization. This was mitigated through interviewing a large amount of employees and through this, the authors encountered employees that were more open to share issues at VTC/VBC compared to others. These issues could then be further validated in following interviews to confirm that other employees expressed the same thoughts. Moreover, as VTC/VBC is a large organization the authors experienced that interviewees sometimes was taking a standpoint that was the most beneficial for their department and not VTC/VBC. By showing quantitative data this phenomenon was mitigated because it is difficult for interviewees to deny this kind of data.

The quantitative data was collected from internal databases at VTC/VBC. There is always a chance that the person extracting the data chooses to show data only beneficial for VTC/VBC and especially LS. This was mitigated by receiving the information from the financial department at VTC/VBC, which is not influenced by the performance of LS. Moreover, the data was triangulated from other sources, which made the authors confident that the used data was correct.

The theoretical framework was mainly collected from web sources and according to Bryman and Bell (2011) web sources in general needs more attention than printed sources. Therefore, the information retrieved from web sources was thoroughly investigated and when the authors could find the same information from several authors it was considered to reliable information. The empirical data collected could of course have been collected from more sources. Many of the interviewees were quite high up in the organizational hierarchy at VTC/VBC and therefore more operational personnel could have been interviewed. However, interviewing 41 employees, conducting two workshops with additional input and support this with three million rows of excel is seen as adequate within the timeframe and scope of the thesis.

3 THEORETICAL FRAMEWORK

The purpose of this chapter is to introduce the reader to the concept of RL, its challenges and consequences. The chapter is divided into three parts where the first part will aim to describe why RL has become an increasingly important subject within most companies today. The second part of this chapter will further target the challenges and describe some of the underlying factors that drive RL. The key takeaways from the theoretical framework are then summarized in the third part with the purpose of describing the complexity of how multiple factors together can create the need for RL.

3.1 Introduction to reverse logistics

This section will describe the background of RL and its growing strategic importance. The fundamental activities and challenges are briefly explained in order for the reader to understand that RL do not just happen; it is a consequence of multiple factors. The purpose is to provide the reader with an understanding of what RL is and why it requires attention from companies all over the world.

3.1.1 Background of reverse logistics

The ever-increasing globalization and changing customer demands creates new challenges for companies around the globe. The fast moving IT technology and global market competition, free from entry barriers, enable companies to deliver increasingly advanced logistics solutions. Moreover, the pressure on limited resources and new environmental laws creates a demand for innovative solutions and new business models in order for companies to stay competitive. While governments are the drivers behind new environmental-juridical standards, customers pay stronger attention to the "green image" of companies by demanding environmentally friendly products (Bonev, 2012). To fulfill these demands, it has become more important to develop sophisticated recycling strategies both in the early stage of the product lifecycle and towards the end of the product lifecycle. Hence, the challenge of managing return flows efficiently has become increasingly important on a strategic level (Lehr *et al*., 2013). The concept of RL has arisen in academia as a way for companies to improve business performance, maintain customer support and to ensure the ultimate profitability in order to gain competitive advantage (Krumwiede & Sheu, 2002).

RL has always been an important activity for companies that handles physical products but the definitions of RL are almost as many as there are written articles about the subject and it is a bit vague when the term was conceptualized (Dekker *et al*., 2004). Terms like reverse flow or reverse channels appeared already during the seventies (Guiltinan & Nwokoye, 1974; Ginter & Sterling, 1978) but it was in the early nineties the first well-known definition of RL was formulized by the Council of Logistics Management (Stock, 1992 p.5). RL was then described as:

"The term often used to refer to the role of logistics in recycling, waste disposal, and management of hazardous materials; a broader perspective includes all relating to logistics activities carried out in source reduction, recycling, substitution, reuse of materials and disposal".

This definition is very generalized and only considers the processes in which the products have been consumed. It does not consider the reverse flow due to e.g. stock adjustments and goods meant for

reuse and hence, the definition found in De Brito and Dekker (2002, p.3) seems more appropriate to support this thesis:

"The process of planning, implementing and controlling flows of raw materials, in process inventory, and finished goods, from a manufacturing, distribution or use point to a point of recovery or point of proper disposal."

This definition is more applicable to this thesis's context since the focus has been on returns that are to be inserted in the forward flow and why these goods are returned and what value that could extracted by recovering them. Having defined RL as a concept that focus on the purpose of recovering value from products, it is therefore of high importance to understand the differences between the forward and reverse supply chain to recover maximum value.

3.1.2 Differences between forward and reverse supply chains

According to Guide *et al*. (2003), there are significant differences between forward and reverse supply chains. These are not well understood and are further complicated by the many types of product returns. In a forward supply chain, the customer is normally the end of the process. However, a closed loop supply chain includes traditional forward supply chain activities and the additional activities that are included in the reverse flow. Hence, closed loop supply chains require increased planning, design and control. The complexity is further increased since users are returning products during the product life cycle, e.g. they can return the product for any reason during a 30, 60 or 90 day period after purchase or due to warranties, repairs or at the end of use. Each type of return requires different supply chain design depending on the product characteristics in order to optimize the value recovery (Guide *et al*., 2003). Moreover, in order for companies to control that the maximum value is recovered, they need to measure on the supply chain performance. Therefore, companies need to differentiate between measurements on the forward and reverse supply chain (Hall *et al*., 2013).

In Fisher's framework for forwards supply chains, products are categorized as either functional (long life-cycle and predictable demand) or innovative (short life-cycle and variable demand). It further discusses two different types of supply chain designs to fit these categories; efficient (deliver at low cost) or responsive (deliver fast). The efficient supply chain is designed to fit with functional products, whereas the responsive supply chain is better suited for the innovative products (Blackburn *et al*., 2004). Similarities can be found for reverse logistic supply chain designs. Blackburn *et al.* (2004) discuss how marginal value of time (MVT) instead of functional/innovative products affects the decision concerning how the reverse supply chain should be designed. MVT can according to Blackburn *et al.* (2004), be seen as a measure of how products lose value over time, where an efficient supply chain should be used for products with low MVT and vice versa. In e.g. the electronic industry, which is characterized by short product lifecycles and high value products, the MVT is high meaning that a more responsive reverse supply chain is beneficial for the company. On the other side of the spectrum, a company with low value products and long product life cycles it is seen to be more beneficial with an efficient reverse supply chain.

Moreover, a similar framework is discussed in Gobbi (2011), where product residual value (PRV) is used instead of MVT. Gobbi (2011) argue that the design of the supply chain should be driven by the

size of the incoming volumes and the expertise needed to process the returns. The article concludes that an efficient reverse supply chains with a centralized approach should be used for products that are to be recycled or scrapped, whereas responsive reverse supply chains is more suitable for products with high PRV. Depending on the context in which the company operates, the strategy for the reverse supply chain must therefore be adapted to suit the returned products.

3.1.3 Reasons why companies work with RL

Looking at a traditional forward logistic flow, the key driving factor is the customer demand in the end of the supply chain. However, the drivers for the reverse flow may not be as obvious. According to academia, the key drivers can be classified into three categories; economics, legislation and corporate citizenship (Bonev, 2012; De Brito and Dekker, 2003). These three drivers affect the decisions and planning since they influence the activities related to the reverse flow. Companies tend to promote their environmental responsibility for commercial reasons but RL would not be as emphasized if there were not any economic benefits involved.

Through effective use of RL, companies can benefit from economical gains through the reuse of products, decreasing disposal costs while reducing the use of raw materials. There are even companies where their main business is to utilize the economic possibilities of RL, e.g. metal scrap brokers and refurbish companies within the electronic industry (Guide *et al*., 2003). These companies maintain high profits by picking up used goods in order to either directly distribute it to other customers or by first refurbishing the product in order to sell it to new markets. Moreover, companies use RL for marketing or strategic reasons. Sensitive technology needs to be protected from the risk of others imitating the products, which creates a pressure on the product recovery activities. Other reasons could be to prepare for future legislations or improving customer relationships. For instance, companies offer the possibility for retailers to send back outdated products in order for them to be replaced by new ones (Bonev, 2012). The economic benefits can therefore be categorized into direct benefits; cost reduction and materials, and indirect benefits; upcoming legislations, green image and improved customer relationships.

New legislations such as manufacturing take-back responsibility, recycling quotas and packaging regulations have recently been created, mainly in Europe and Japan, to make companies rethink their processes in order to protect the environment. By doing this, Japan managed to break the rising CO2 emissions through forcing the automotive industry to bring forward new technological solutions (Bonev, 2012). Another example is that original equipment manufacturers or dealers are responsible for the final disposal or recycling of unwanted products. In this case, the manufacturer bears responsibility if the final users do not dispose the product properly, which can cause additional expenses for the manufacturer. This creates an increased interest for companies to manage the return process to ensure that their products do not cause environmental damage (Blumberg & Donald, 2004).

The last key driver; corporate citizenship, implies that companies have a set of corporate values that makes them obligated or responsible to work with RL. This could e.g. generate a greener image, which is mainly a result from increasing customer demands on environmental solutions. This image can according to Dekker and Fleischman (2013), be used in marketing activities by communicating

these values in order to reach customers that base their buying decision on such factors. The key findings from this chapter are that there are several benefits of working actively with RL. However, companies must further consider the industry and product characteristics when managing their reverse flows.

3.1.4 Reverse logistics in different industries

Companies are increasing their efforts towards RL all over the world, not only due to the increase of environmental demands but also since it can lead to a large increase of profits. Recently it was found that U.S companies spend over $100 billion annually on product returns, which caused an average profit loss of 3.8% (Petersen and Kumar, 2010). This estimate did however not include the costs associated with redistribution, disposition and administration among others (Petersen and Kumar, 2010). Despite the increasing attempts to reduce returns, it has become a necessary evil that companies do not work actively with.

Blackburn *et al.* (2004) further divide product returns into two main categories; (1) Consumer returns due to damages, defects, product recalls, impulse purchases and inaccurate order fulfillments and (2) supplier returns of overstocked or unsold items to the manufacturer as part of the 'buyback' policy. Moreover, these can be divided into B2C and B2B returns, where the latter often is a result of a contractual option to return products to the supplier. In this case, the returned products have either been damaged during transportation, wrongly delivered or can no longer be placed on the shelf due to e.g. lack of demand. These returns play a major role for products with short shelf life such as dairy products but are also commonly returned in the context of spare parts in the automotive industry (Bonev, 2012). Regardless of the product type, RL is a constant challenge for companies to manage the logistical activities involved and Blackburn *et al*. (2004) is further describing 5 key activities within RL:

- Product acquisition - Acquire the returned product from the end customer
- RL - Distribution setup to handle the returns that involves inspection, sorting and disposition
- Inspection and disposition - Evaluate the condition of the used product to make the most financially beneficial decision for the product e.g. to resell it or scrap it.
- Remanufacturing (or refurbishing) - Return the product to re-saleable condition
- Marketing - Investigate and market the product at alternative market to resell the product

These five logistic activities are highly important to consider when designing the reverse supply chain. Many of the returned products are not just scrap, but an opportunity for companies to utilize the remaining value of the products (Bonev, 2012). These activities are moreover divided into three main areas; collection, inspection and processing and the purpose of describing these further in the next section is to understand the complexity of activities involved in RL, which drives large amount of costs.

3.1.5 Activities associated with reverse logistics

Within RL there are several steps and these are visualized in figure 5. All of these steps need to be considered in order to handle the RL as efficient as possible (Bonev, 2012; Barker and Zabinsky, 2008).

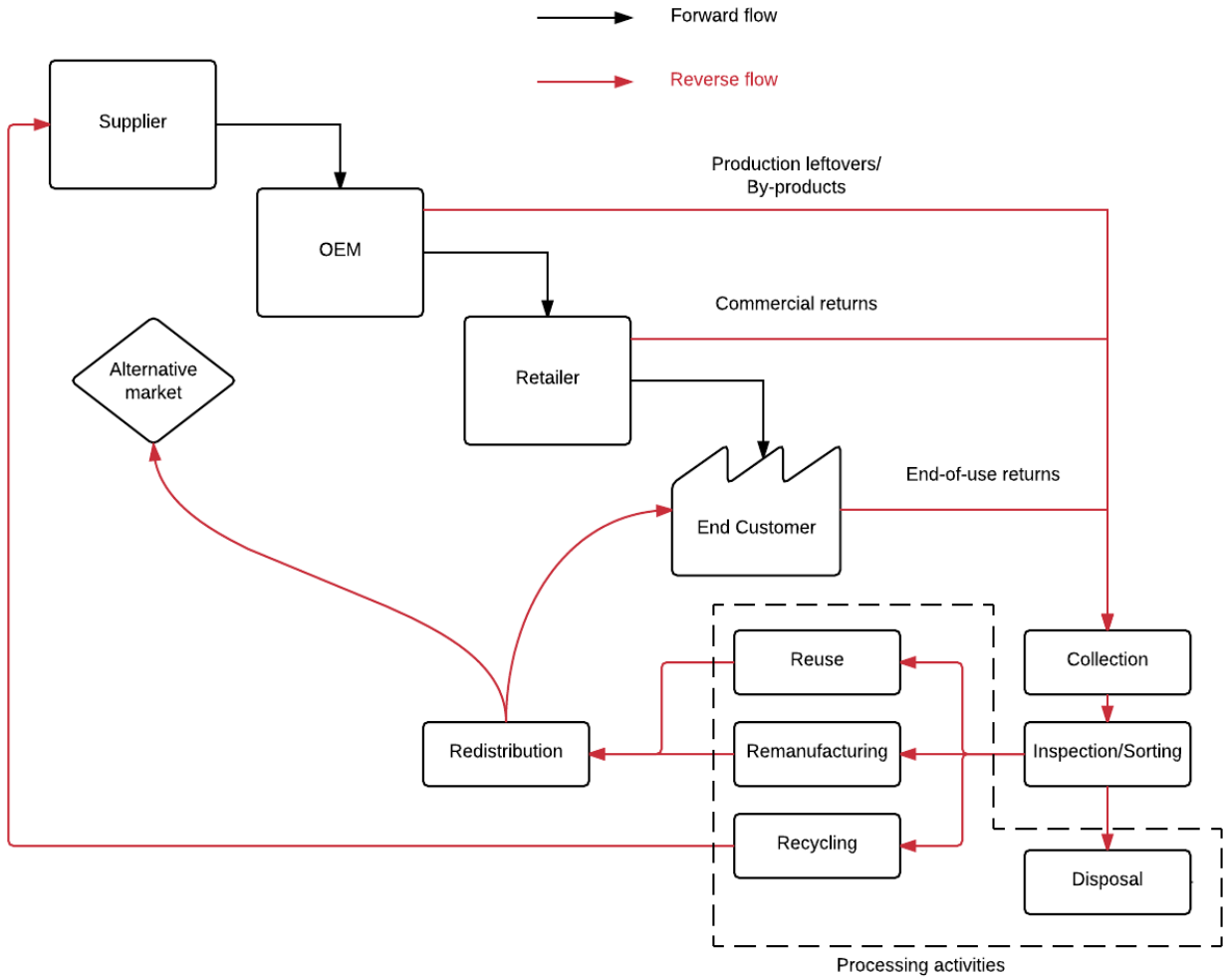

Figure 5. Overview of a supply chain including the reverse flow (adapted from Bonev, 2012)

3.1.5.1 Collection of returns

The process of RL starts with the collection of the returned goods. The collection activity includes locating the products that is in need of a return, transportation and storing of the returned products at selected collection points (Bonev, 2012). This activity is deemed as one of the most important as the collection process is both a time consuming and costly process but when handled efficiently, organizations can both save money and use it as a competitive advantage. Furthermore, Bonev (2012) argues that there are several uncertainties that organizations have to deal with when handling the collection of returned products. There are uncertainties concerning the location of the returns i.e. where and when does the returns occur. Other uncertainties are regarding the quantity of returns and

their time of arrival. These uncertainties affect the planning and execution of the collection process and therefore have to be considered when dealing with this process. Moreover, another aspect that needs to be considered when dealing with the collection process is what kind of collection system that needs to be used when handling the returns.

3.1.5.2 Inspection and sorting of returns

After the products have been collected, the inspection and sorting phase is initiated. In this phase the quality and condition of the product is of primary concern as it decides what kind of activity it will require in the processing phase. When the returns have been inspected, they will be sorted and split into the return flows according to what appropriate processing that is needed (Bonev, 2012). Inspection often requires a lot of manual work because evaluating the status of the returns is difficult to determine through digital means. There are of course exceptions like some computer equipment and electronics that can be diagnosed remotely, but most products need to be evaluated physically. This implies that this process is quite costly and time-consuming and it is therefore important the best solution for the inspection and sorting is developed as this could otherwise add extra cost if done in an inadequate manner (Bonev, 2012).

Inspection and sorting could be performed either at a *centralized location* (centralized approach) or at *distributed locations* (a decentralized approach) (Barker & Zabinsky, 2008). Using a centralized approach is appropriate for commodity product, e.g. construction sand recycling, as the high volumes will lead to economies of scale when transporting and inspecting the goods. Having a centralized approach is beneficial to use when the testing and inspection procedures are expensive as it will minimize the cost of the equipment and special labor due to high volumes. On the other hand, using a centralized approach could lead to higher transportation cost as the point of inspection is further up the supply chain and products that could have been scrapped earlier is not detected and inspected until it reaches the centralized site. Using a decentralized approach is common when low-cost testing procedures could be used. When using this approach scrap could be identified early and directly shipped to waste disposal instead of being sent all the way back to a centralized site. One important factor to consider when handling this approach is that the testing procedures have to be consistent and reliable in order to identify scrap. The distribution network may become more complex as the scrap and the products that could be reused are shipped in separate flows (Barker & Zabinsky, 2008).

3.1.5.3 Processing of returns

The processing phase consists of several activities and which specific activity that will be performed is depending on the condition and quality of the product, e.g. reuse, recycling or disposal (Bonev, 2012). Reuse of products will occur when the product is in such a good condition that they could be used right away with almost no repair processing for either the original market or an alternative market e.g. Amazon or eBay (Bonev, 2012). In the recycling process, the products are disassembled and then divided and processed with homogenous components. The parts that are recyclable are then removed and processed separately (Bonev, 2012. The disposal of products occurs when none of the processes stated above could be used due to quality or economic reasons. When the products enter the inspection phase they can be rejected if the condition of the product does not meet the standards needed for reuse or remanufacturing and therefore the product needs to be disposed. When products have been processed, the need for redistribution will occur. Redistribution implies distributing

products in re-saleable condition to the original market or an alternative market (Bonev, 2012). The key takeaways when describing the RL activities is that handling these efficiently could prevent companies from suffering from large amounts of unnecessary costs that do not add value. Moreover, companies within the automotive aftermarket tend to neglect the importance of these activities, which affects their aftermarket profit negatively. The current returns situation is briefly described in the next section.

3.1.6 Reverse logistics within the automotive aftermarket

There has been an increasing attention towards product returns from companies operating in the aftermarket. This is due to several reasons but the largest issue is that when handling returns improperly it could reduce the automotive companies' net profits for the aftermarket by 35 percent. Moreover, effective returns management can enhance the brand value for automotive companies when working actively with RL. Automotive companies that successfully manage their reverse flows have been able to reduce the returns vs. sales, cycle times and increase the level of validation (Inmar Reverse Logistics, 2009).

The automotive aftermarket is a very complex industry. The increasing number of SKUs and the multi-step supply chain that consists of extremely complex financial, physical and information flow makes RL within this industry very difficult to manage. It was shown that the average return rate within the automotive industry was around 9,7% and the reasons for these returns is further divided in figure 6 (Inmar Reverse Logistics, 2009).

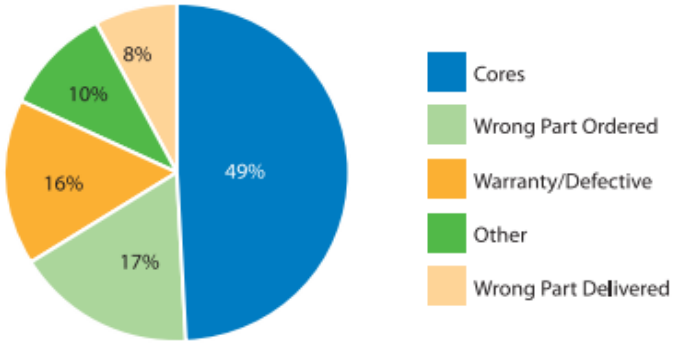

Figure 6. The distribution between return reasons in the automotive aftermarket (Inmar Reverse Logistics, 2009)

Based on these return flows, the value of returns within the automotive aftermarket were around $3,5 to $5,7 billion. The factors that contributed to these returns were among others low degree of information sharing, shipments received are incorrect, inadequate vehicle diagnosis, ordering too much and warranties/defective parts. Manufacturers are concerned that the misdiagnosis is the key reason for returns. Since the return policies often enables free returns, placing the part which was not needed in the inventory for later use is not commonly done, and instead the part is returned (Inmar Reverse Logistics, 2009). The identified challenges within the automotive aftermarket are similar to some of the general RL challenges. These will be described more thoroughly in the next section.

3.2 Key challenges within reverse logistics

It was identified in chapter *3.1 Introduction to reverse logistics* that there are multiple factors affecting the need for RL. By comparing challenges with RL in general and with the challenges found in the automotive industry and at VTC/VBC several key challenges were identified. Therefore, it was chosen to further strengthen and expand the theoretical findings in the areas of *Characteristics of the aftermarket, The complexity and uncertainties within reverse logistics, Inventory management, Return policies, Key performance indicators within RL* and *The challenges of information sharing and visibility.* Moreover, this will facilitate the process of answering all the research questions for the thesis.

3.2.1 Characteristics of the aftermarket

The importance of spare parts has increased the last decades as organizations have understood that the availability of spare parts influences the customer satisfaction and that it is a large share of a company's profit (Syntetos *et al*., 2012; Stoate & Smith, 2005; Wagner *et al*., 2012). The need for spare parts arises when a product breaks, fails or sometimes just needs to be replaced and the demand is therefore difficult to predict. Wagner *et al*. (2012) characterizes the demand of spare parts as fluctuating and volatile and that it is affected by stochastic factors such as the intensity of the products, wear behavior, failure rates and what type of maintenance that is offered to the customer. Romeijnders (2012) distinguishes between two types of maintenance; preventive and corrective maintenance. On a high level, the difference is that a preventive maintenance is done with e.g. a fixed maintenance interval to detect and fix issues before they occur, which could be less costly. The corrective maintenance is however done after the issue occurred, which will make it more difficult to plan for and it could become more costly. Wagner *et al*. (2012) further discuss that the trend within the maintenance and aftermarket is towards having a one touch solution, where the customer is purchasing a service instead of a product, i.e. changing the business model towards servitization. For example, in the truck industry, the customer can buy uptime for the truck i.e. how many hours the truck should be used. It is costly for customers to have trucks idle as every hour of downtime is measured as lost profit (Makarova *et al*., 2015). To facilitate the ownership for the customer, different service agreements could be established to ensure that the truck is meeting the expected uptime. When comparing an aftermarket supply chain with a manufacturing supply chain, one can see additional differences, which are further highlighted in table 1.

Table 1. Differences between manufacturing supply chain and an after-sales service supply chain

Parameter	Manufacturing Supply Chain	After-sales services Supply Chain
Nature of demand	Predictable	Always unpredictable
Required response	Standard, can be scheduled	ASAP (Same day or next day)
Number of SKUs	Limited	15 to 20 times more
Product portfolio	Largely homogenous	Always heterogeneous
Delivery network	Multiple networks	Single networks
Inventory management aim	Maximize velocity	Pre-position resources
Reverse logistics	Does not handle	Handles returns, repairs and disposal of failed components
Performance metric	Fill rate	Product availability (uptime)
Inventory turns	6 to 50 a year	1 to 4 a year

Source: Cohen *et al.*, 2006

Table 1 is showing that the aftermarket is highly complex to manage and according to Saccani *et al*. (2007) aftermarket sales of services and spare parts could generate approximately three times the turnover of the original purchase during the product's life-cycle. During the product's life cycle, the need for spare parts will vary depending on which stage the product is in, see figure 7.

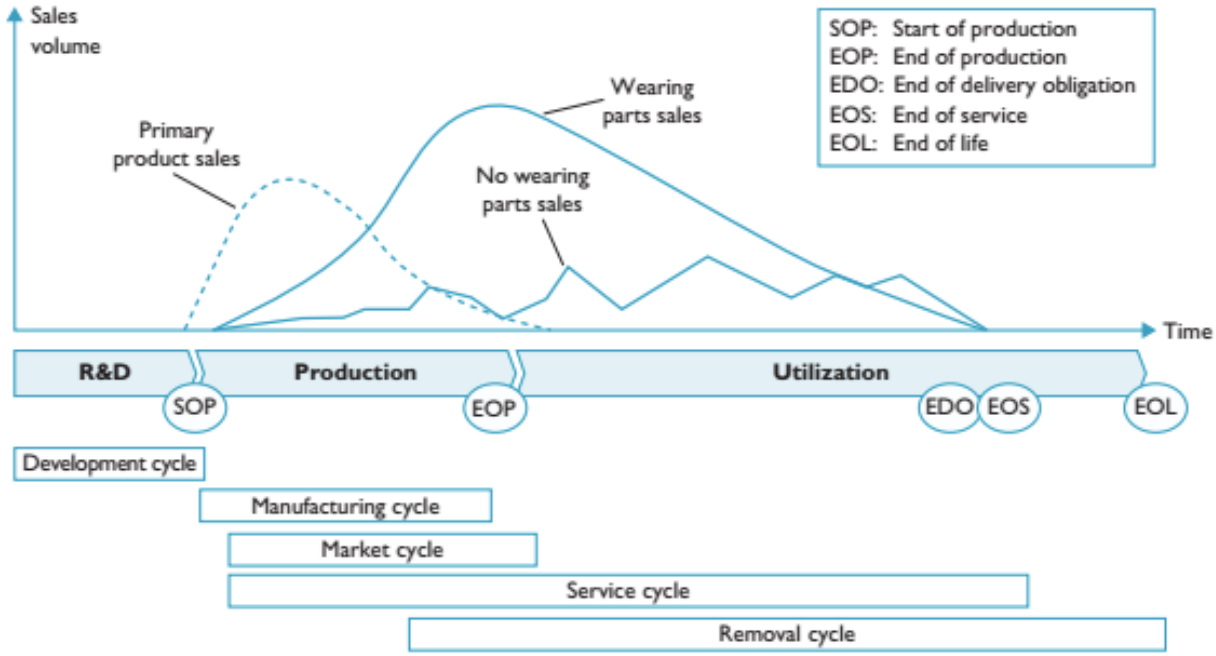

Figure 7. The change in demand of spare parts during the product's lifecycle (Wagner *et al.*, 2012)

In the R&D phase, the products is designed and constructed which will set the foundation for future production and distribution. Therefore it is important to consider which spare parts that are likely to be needed as this will influence the service level of the after sales (Wagner *et al*., 2012). If the OEM has planned a need for certain spare parts in this stage it will increase the availability of these parts, which will in the end increase the customer satisfaction. During the production phase, the primary product will enter the market and thus the probability of the product breaking down, which creates a need for spare parts as the service cycle has started. When the primary product then goes out of production the need for spare parts will remain. According to Stoate and Smith (2005), there are different legislations deciding how long a spare part has to be available and for the automotive industry it could range between 12 - 15 years. This forces companies to keep an inventory for these parts, which implies that having control over the primary product's life cycle and which spare parts that are needed will lower the total supply chain cost. Wagner *et al.* (2012) discuss additional reasons, except from the lower supply chain cost, why it is important to align the strategic planning with the handling of the spare parts;

- The primary product's market could change e.g. through technical breakthroughs. This will require a change in the spare part strategy in order to avoid decreasing customer satisfaction and losing market share.
- Having a good spare part strategy will increase the profit margin and enhance the customer loyalty.
- The competition in the spare parts market is intensifying through more market actors and spare part imitations.

- The expectations and demands of the customer are increasing in terms of shorter lead-times and higher availability of spare parts.

The importance of aligning the spare part strategy can therefore not be stressed enough. Coping with the challenges presented above often involves handling returns, which complexity is further increased by a number of uncertainties that will be presented in the next section.

3.2.2 The complexity and uncertainties within reverse logistics

Dealing with the increasing complexity of both the forward and the reverse flow force companies to constantly develop their logistics operations. The constant challenge of improving the supply chain value to cope with increasing customization and fast changing technology will increase the scrap and rework for organizations around the world. This trend will in turn lead to higher amount of returns. According to Bonev (2012), many believe that customers are becoming more demanding in terms of quality and service in the future and as products are becoming more complex, the flows related to repair or replacement will increase. At the same time, customers are not accepting long repair times and as often mentioned the trend is to switch from buying the physical product to buying a service. This is particularly present in the automotive industry, where leasing is getting increasingly important for the automotive companies. As a consequence, the key challenge for companies to handle their RL is the uncertainty, which are all affected by the time and cost factors. The main uncertainties identified in Bonev (2012) are presented in figure 8.

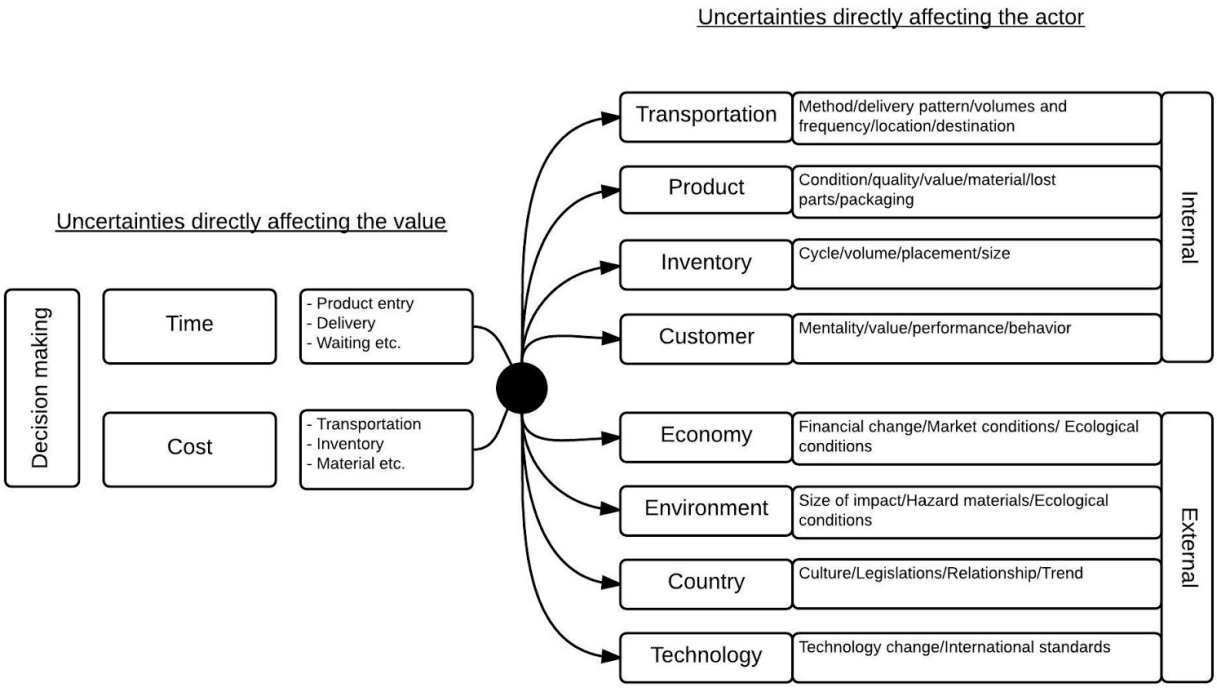

Figure 8. Uncertainties in reverse logistics (adapted from Bonev, 2012)

As seen in figure 8, the uncertainties can be divided into internal and external but are still related to each other. The actor is able to control the internal uncertainties to minimize the impact and they can be significantly reduced by appropriate return policies. These uncertainties further affect e.g. the

capacity planning of RL, which challenges companies to find innovative solutions. The organization is on the other hand not able to control the external uncertainties as they are generated by the environment. However, they can actively work with preparing the business to minimize the impact.

3.2.3 Return policies

There are several different policies that could be adopted when it comes to returns. On the return policy spectrum there are two extremes; either the customer gets a full refund when returning products or no refund. Using a return policy will help the manufacturer to share the retailer's risks, in terms of avoiding e.g. excessive stock (Kulkarni *et al.*, 2015). It will also assure the retailer that the manufacturer will not push out new product in a fast pace to make the old ones obsolete (Padmanabhan & Png, 1995). Furthermore, Kulkarni *et al.* (2015) argues that establishing appropriate return policies will improve the manufacturer's profit during deterministic demand. In addition to the risk sharing, an appropriate return policy could be a tool in marketing and advertising to attract new customers (Padmanabhan & Png, 1995). However, not establishing an appropriate return policy could lead to increased logistics cost, other excessive costs and decreasing customer satisfaction (Kulkarni *et al.*, 2015). Companies need to be aware of the trade-off between cost and customer satisfaction when choosing an appropriate return policy (Padmanabhan & Png, 1995).

Moreover, Padmanabhan & Png (1995) discuss different factors that should be considered when designing a return policy, see table 2.

Table 2. Factors determining return policies.

Full Returns policy	No Returns policy
• Risk-averse retailer • Weak retailer competition • Retailer do not trust manufacturer • Competing brands undifferentiated	• Uncertain primary demand • High production and logistics cost • Low salvage value • Manufacturer do not trust retailer

Source: Padmanabhan and Png, 1995

Between full returns policy and no returns policy, there are different approaches companies can have. Padmanabhan & Png (1995) argue that a partial return policy could be beneficial and it is shown that it is suitable in different contexts. A partial return policy could e.g. be based on quantity and time where a retailer could send back e.g. 40 percent of the ordered products within 15 days. This makes the retailer more cautious of what they order from the beginning and what they later on return and this kind of return policy is further supported by Gurnani *et al.* (2010) and Su (2009) as a suitable approach when designing a returns policy. However, Gurnani *et al.* (2010) and Su (2009) discusses the partial returns from another perspective. They argue that a partial return policy should be based on a percentage of sales prices instead of using a percentage of the ordered quantity. By basing the policy on percentage of sales price instead of ordered quantity, the manufacturer will be less affected by fluctuations in price if the product has a short product life cycle. The manufacturer will then be able to adapt to the context in a more efficient manner. Moreover, penalties should be established e.g. if the stock level at the retailer does not meet the contractual agreement or that the dealer misuses the

returns (Darwish & Odah, 2010). This could e.g. make the supplier more cautious when executing and controlling the replenishment of stock at the retailer.

3.2.4 Inventory management

To facilitate collaboration between the actors in the supply chain, several different supply chain co-operation models have been discussed among the supply chain community (Niranjan *et al.*, 2012). One of these models is called vendor-managed inventory (VMI). This model discussed since it is the setup used for the aftermarket within VTC/VBC. In a VMI-system, the basic thought is that the downstream actor e.g. a retailer, shares demand and point-of-sales (POS) data with their upstream supplier. The suppliers then take on the responsibility of managing the inventory at the retailer and often maintain the ownership of the inventory until it has been sold (Mittal *et al.*, 2012). This in order to secure healthy stock levels at the retailer but if the setup is not well managed since e.g. the information sharing is inadequate, the VMI system could drive returns if e.g. stock levels get too high (Niranjan *et al.*, 2012).

The basic assumption in a VMI system is that the supplier will be the owner of the stock until it is sold, and at the point of sale the margin will be divided between the retailer and the supplier (Mittal *et al.*, 2012). Hart and Moore (1990) investigates the ownership aspect a bit deeper and argue that where the ownership should be is determined by the number of trading partners a supplier is supplying and the customization degree of the product. A trading partner is defined as another actor that uses the same supplier. If a supplier is supplying several different trading's partner with the same type of product, the ownership should remain at the supplier until the product is sold. This will make it possible for the supplier to take back products from one trading partner and replenish another without changing ownership of the product (Hart & Moore, 1990). Hence, this will decrease the administrative cost and the need for IT-support that is associated with the change of ownership.

Using a VMI-system could furthermore be beneficial in several ways. It gives more control to the supplier as they receive information about sell patterns and demand at the end-customer, which will make it easier for the supplier to plan and execute their production and distribution. This could lead to lower supply chain costs and increase the service level at the retailer and through this, both parties can increase their competitive advantage (Niranjan *et al.*, 2012). However, there are some other difficulties associated with the implementation and execution of a VMI-system in addition to the information sharing and contractual agreements. It requires more planning in detail at the supplier and the administrative cost of monitoring stock levels is moved from the retailer to the supplier, which will require that the supplier has the expertise needed for managing stock replenishment efficiently. According to Mittal *et al.* (2012) another crucial aspect when establishing a VMI-system is that the risks are shared between the supplier and the retailer. In a case where the supplier has replenished the retailer's stock with a product that is not selling, the buyer should have the option of sending it back to the supplier, free of charge, in order to e.g. free up shelf-space. Moreover, using a VMI-system will require extensive data sharing between the retailer and the supplier, which implies that investments has to be done setting up proper IT-support to facilitate the information sharing (Niranjan *et al.*, 2012).

3.2.5 The challenges of information sharing and visibility

Hall *et al.* (2013) identified the most common challenges within inbound and outbound RL where the key challenges mainly involve product movement in the reverse flow. Communication was among the top challenges for both flows causing frustration in today's complex supply chain environment. Hall *et al.* (2013) further argues that IT solutions can solve many of the communication issues. Another challenge regarding communication and the information flow are the people working on a daily basis trying to meet the customer need and extract information from the customer to meet these needs (Shapiro *et al.*, 2004). When an issue occurs and the customer wants to place an order they may contact a customer service center. Customer service representatives could lack experience and expertise within certain areas which could make them e.g. not understanding the customer needs or the importance of that specific customer which could affect the ordering process negatively (Shapiro *et al.*, 2004).

Furthermore, one famous concept within the supply chain literature is the "bullwhip effect" that is a consequence of lacking information sharing and coordination, where large order variation/incoming orders at the end customer could cause large problems upstream in the chain (Niranjan *et al.*, 2011). Cachon *et al.* (2007) argue that it is not high order variance per se that is the main issue. The focus should instead be on the underlying information distortion and what kind of information that is shared and its impact on the physical flow and the financial implications. The level of distorted information could be affected by many factors, where order variance is one and the accuracy of the forecast could be another (Niranjan *et al.* 2011). Moreover, information distortion could be both intentionally and unintentionally. For example, P&G customers unintentionally made their suppliers believe that the demand was higher than it actually was because they started to order in batches instead of smaller quantities. However, another case showed that the customer intentionally ordered more than they needed and hoped that the partial delivery should cover the actual demand in order to secure the availability of products (Niranjan *et al.* 2011). The difficulties of information sharing and visibility cannot be stressed enough within RL. To develop the RL processes within a company, it is therefore imperative to measure on the performance in order to target improvements and to visualize advancements.

3.2.6 Key performance indicators within reverse logistics

Within any department or part of an organization it is important to use performance indicators to secure an effective and efficient organization. The primary objective of KPIs is to make sure that a specific process generates value for the company (Hall *et al.*, 2013). Niranjan *et al.* (2011) argue that companies cannot control and improve what they do not measure. Therefore, measure and follow up the KPIs of an organization is of high importance and should be seen as a strategic activity (Cai *et al.*, 2008). Some companies tend to fail in measuring their performance as they use too many KPIs, which leads to not knowing which KPI that is important. This leads to another aspect why companies sometimes fail when using a KPI that is not measuring towards the overall business goal. A consequence of this is that the KPIs can cannibalize on each other and lead to suboptimization (Akyuz & Erkan, 2009).

When measuring on RL it is important that these measurements are aligned with the overall goal of the organization (Hall *et al.,* 2013). According to Hall *et al.* (2013) companies tend to use the same KPIs for the reverse flow as they do in the forward flow and some metrics are applicable e.g. cycle times, delivery precision and similar efficiencies measures. However, the view on RL compared to the forward flow differs within organizations in terms of what is important in each flow and the metrics used to quantify the result in the forward flow should therefore differ to some extent compared to RL. For example, in the forward flow the customer may not be concerned regarding the ordering process and how it should be handled due to that it is often quite straightforward, the customers are often more concerned about the lead time. In the return flow, customers are more concerned about the return process and if the process of returning is easy to manage. Hence, customer satisfaction could be measured in different ways (Hall *et al.*, 2013). Moreover, according to Inmar Reverse Logistics (2009), measuring the reverse flow situation within the automotive aftermarket different metrics are commonly used, e.g. returns as a percentage of sale and cycle-times. The returns as a percentage of sales is also used to compare similar companies in order to evaluate the respective reverse flows.

3.3 Concepts of change management

This section will describe the basics of change management. The theory displayed in this section is not affecting RL per se, it is to support and facilitate answering a part of research question three in the third part of the analysis where the initial implementation of the suggested actions is analyzed. By adding this section to the theoretical findings it is seen to increase the validity of the last part of the analysis. There are several concepts and models developed within change management and this thesis has chosen to focus on two of these and they are presented below.

3.3.1 Lewin's change model

This model is built around three phases were the first is the unfreeze phase, the second phase is when organizations makes the change and the last phase is re-freezing the change (Lewin, 1951). When entering the unfreeze phase, it is of high importance to remove the forces opposing the change, which is also known as resistance to change (Schein, 1996). To prevent this phenomenon it is highly important for organizations to make everyone in the organization understand why the change is made and that the change is needed in order to secure a prospering and profitable future for the organization. Providing disconfirming information to the employees is not enough as they need to be able to relate to it in a positive way and accept the information in order to feel motivated to change (Schein, 1996). In order for employees to embosom the change, their survival anxiety has to be higher than the learning anxiety meaning that the employees' urgency to change is higher than their own self-interest of not changing. When this is reached, the change phase will become easier to implement and more successful (Schein, 1996). The last phase can then be initiated by refreezing the organization in the desired state after the change is made and this is imperative in order to make the change sustainable in the long-term (Schein, 1996).

3.3.2 Kotter's eight steps of change

Kotter (2007) is discussing eight steps that organizations need to go through in order to perform successful change. These will be briefly explained below.

The first step that is considered to be one of the most fundamental of the eight is that companies need to create a sense of urgency within the organization. Overlooking or underestimating this step is a common reason why companies tend to fail in large change initiatives. Moreover, companies also tend to not understand the importance of leadership when performing a change. Therefore, step two is to create a coalition that can lead the change and this coalition should consist of at least one employee from upper management. The third step emphasizes the importance of creating a vision and strategy for the change in order to steer it in the right direction. This leads to fourth step where the coalition needs to communicate the change and the vision of the change in order for employees to embrace the change. The fifth step is to encourage and empower other employees to become involved in the change and remove resistors that oppose the change. Step six is to create short-term goals and to celebrate these goals when they are met in order to increase the motivation of employees involved in the change. In step seven it is important to make sure that the victory is not declared on beforehand and make sure that change is really implemented. The last step is to institutionalize the change and make sure that the top management is personifying the change. (Kotter, 2007)

3.4 Summary of the theoretical framework

When reviewing the literature, several drivers and challenges associated with RL were discovered and they are compiled in table 3. Summarizing and visualizing the complexity of RL from the theoretical findings makes it easier for the reader to understand it. This will also facilitate the analysis of drivers found in the literature compared to the drivers in the empirical findings, which increases the validity of the report.

Table 3. Important components of the theoretical framework

Theoretical area	Drivers of reverse logistics	Authors
Characteristics of the aftermarket (CA)	• Availability • High margins • Product lifecycle • High uncertainty	Syntetos *et al.* (2012) Stoate and Smith (2005) Wagner *et al.* (2012) Romeijnders (2012) Makarova *et al.* (2015) Cohen *et al.* (2006) Saccani *et al.* (2007) Bonev (2012) Inmar Reverse Logistics (2009)
Understanding the potential and importance of RL in reverse SC (UPIRL)	• Globalization • Fast moving IT • Changing demands • Environmental legislations and increased customer awareness • Opportunity for profits • External uncertainties • Low priority of RL	Petersen and Kumar (2010) Blackburn *et al.* (2004) Gaiardelli *et al.* (2006) Mollenkopf *et al.* (2011) Mollenkopf (2010) Vachon *et al.* (2014) Bonev (2012) Inmar Reverse Logistics (2009)

	• Competitive advantage	
RL Activities (RLA)	• Internal uncertainties • Processing of returns • Point of inspection • Scrap management • Reverse supply chain design • Activities not adjusted to product characteristics • Visibility	Bonev (2012) Barker and Zabinsky (2008) Gobbi (2011) Guide *et al.* (2003) Blackburn *et al.* (2004)
Key performance indicators (KPIs)	• Measure against overall business goals • Lack of RL specific KPI • Low priority of RL	Hall *et al.* (2013) Niranjan *et al.* (2011) Cai *et al.* (2008) Akyuz and Erkan (2009) Dombrowski *et al.* (2007)
Inventory Management and Information Sharing (IMI)	• Forecast • Ownership • Contractual agreements • Information sharing • Communication • Visibility • Supply chain perspective	Niranjan *et al.* (2012) Shapiro *et al.* (2004) Mittal *et al.* (2012) Hart and Moore (1990) Darwish and Odah (2010) Niranjan *et al.* (2011) Cachon *et al.* (2007) Kulkarni *et al.* (2015) Padmanabhan and Png (1995)
Return Policies (RP)	• Type of policy • Level of refund • Risk-sharing • Trade-off between cost and customer satisfaction	Kulkarni *et al.* (2015) Padmanabhan and Png (1995)

In order to understand the complexity of table 3, the theoretical areas are visualized in figure 9 to show that there are several areas affecting different stages of the supply chain, which can create a need for RL. Drivers are marked with a D and where the appropriate actions should be is marked with an A. Moreover, figure 9 is showing that the context of the market a company operates in affects the need for RL. How the forward supply chain is set up from an inventory management, information sharing and KPI perspective and the reverse supply chain with return policies, associated activities and KPIs are furthermore highly influencing RL. These areas in combination with understanding the importance of RL are imperative to increase the performance of the organization. In each of the areas there are several drivers, see table 3, which create a need for RL. Drivers of RL could happen simultaneously which makes it necessary to understand how they affect each other and that several actions could be needed to reduce the need for RL.

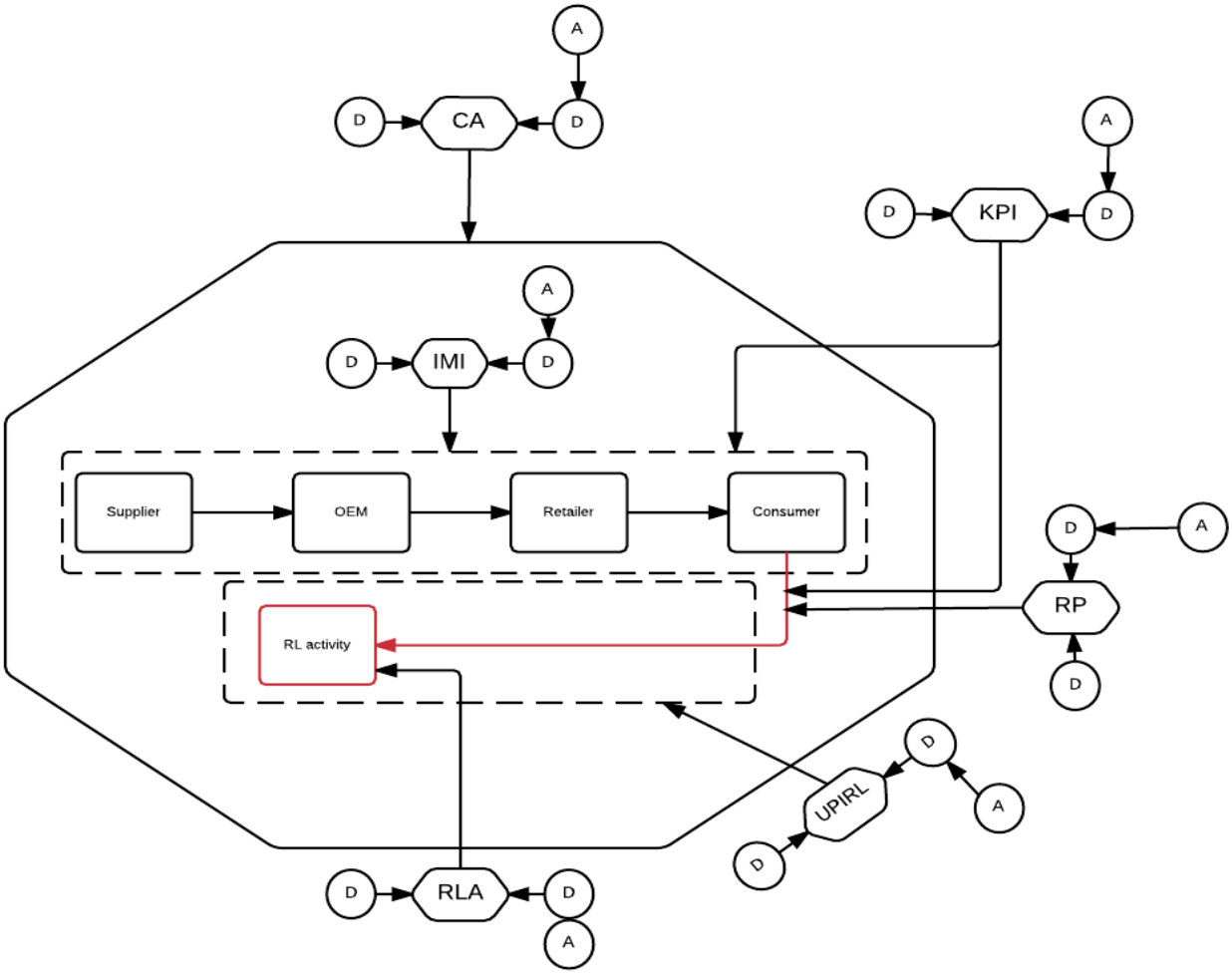

Figure 9. Visualizing complexity and different drivers for reverse logistics

The theoretical findings have provided several drivers both within RL in general and specifically for the automotive aftermarket. The A3 logic presented in chapter *2.3 Data analysis* will be used to further identify the key drivers of RL within VTC/VBC, which will be supported by figure 9.

4 EMPIRICAL FINDINGS

Through interviews, internal documents and direct observations, the empirical findings is compiled in this chapter and divided into two parts. The first part of this chapter will introduce the reader to the background of VTC/VBC and their logistic operations, both in the forward and reverse flow, followed by a description of current KPIs and the focused return codes. This is in order to understand the more in-depth information provided in part two where the as-situation for returns and why they occur on a European and Swedish level is explained. In the end of part two challenges within the two focused return categories will be explained. The purpose of this chapter is to answer research question 1 as well as giving the reader further insight into the VTC/VBC organization. The findings are then summarized and compiled into two frameworks in order to introduce the reader to the key drivers for RL within VTC/VBC, which will work as a foundation in the analysis chapter and answering of research question two.

4.1 Description of the context and processes at VTC/VBC

This section will describe the background of the company and how VTC/VBC are currently operating in the aftermarket both from a forward and RL perspective. The purpose of this section is to give the reader insight to Volvo Group and the aftermarket operations within VTC/VBC with focus on RL. This is in order to understand the basics of the organization and its processes to be able to understand how one process affects another in the reverse supply chain.

4.1.1 Background of Volvo Group

The brand Volvo was founded in 1927 as a car producing company and in 1928 they manufactured their first truck (Volvo Group, 2015b). Volvo Group is a large and multinational company within the automotive industry and is one of the world's leading manufacturers of buses, trucks, construction equipment and marine and industrial engines. Their products are sold in over 190 markets and they have production facilities in 19 countries with their headquarter in Gothenburg, Sweden (Volvo Group, 2015a). In 2015, Volvo Group had a turnover of approximately 283 billion SEK. The last decades, Volvo Group has grown primarily through merger and acquisitions and additional brands and products have been added to the Volvo portfolio. Up until now Volvo Group has bought and sold different parts of the organization and the most famous event being when they sold their car department in 1999 to Ford Motors (Volvo Group, 2015b). The current Volvo brands are illustrated in figure 10, which is further divided into owned brands, joint ventures and strategic alliances.

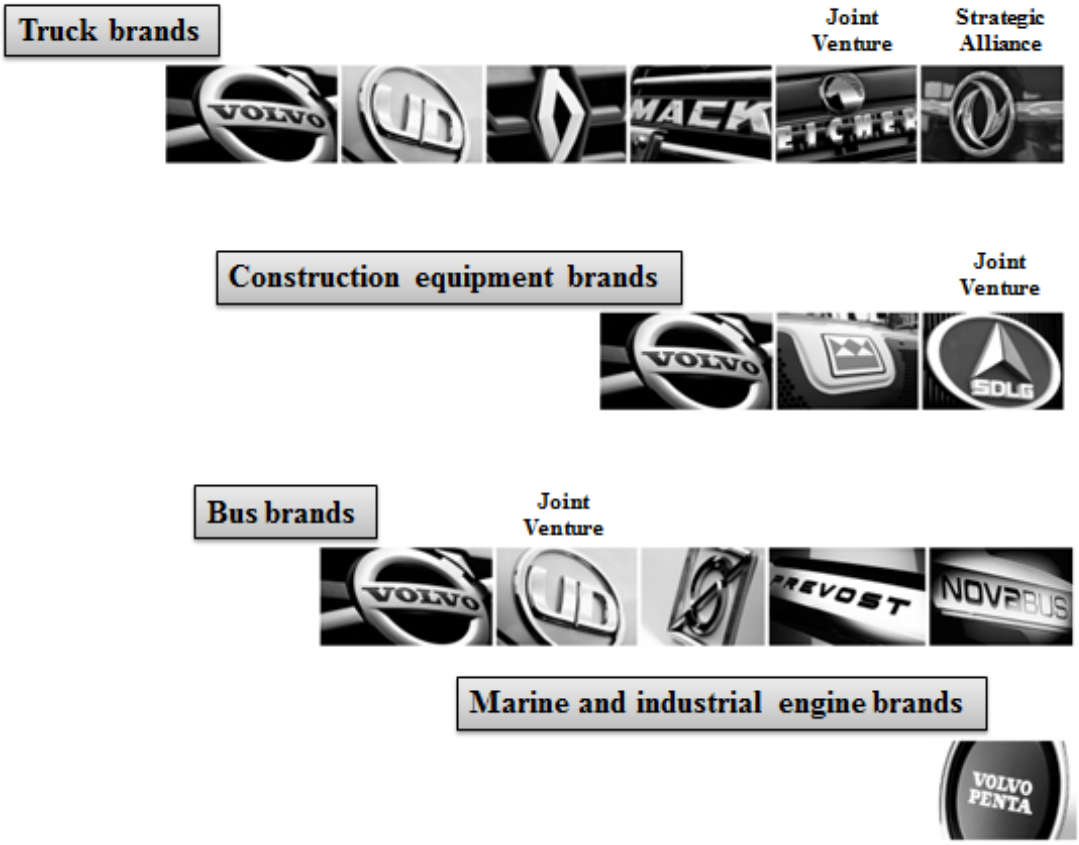

Figure 10. Overview of the ownership structure of Volvo Group (adapted from Volvo, 2015b).

A challenge for Volvo Group when growing through merger and acquisitions has been to align all the brands in order to find synergies. This has created problems to realize benefits between the brands as processes and procedures are handled very differently. This thesis is focusing on VTC/VBC since they are generally handled very similarly and they are often both sold at the same dealers. VTC/VBC vehicles are sold and repaired through a network of 650 dealers and 1450 repair shops spread out over the globe. Within VTC/VBC there are several departments accounting for different parts of the organization. The thesis was performed at Logistics Services (LS) that is managing both the replenishment of dealer inventories and the reverse flow in the aftermarket.

4.1.2 Replenishment setup for the aftermarket at VTC/VBC

VTC/VBC is distributing spare parts to their global customers through a set of distribution centers around the world. They use central distribution centers (CDCs), regional distribution centers (RDCs) and support distribution centers (SDCs). The large flow of goods mainly goes through what is called stock orders and day orders. The parts that are more frequently sold are primarily replenished automatically through stock orders. As the demand for stock orders are much less difficult to forecast than day orders, it makes it easier for VTC/VBC to establish a more efficient supply chain for these orders. The stock orders are supplied from the CDCs, where larger quantities of spare parts are stored that enables VTC/VBC to leverage from economies of scale in their distribution and at the same time maintain high service levels towards the dealers. To further enable dealers to establish high service levels towards the end-customer, VTC/VBC offers a responsive distribution through day orders as an alternative to the regular refills from stock orders. By doing this, VTC/VBC generally promise their

dealers a delivery the day after the order has been registered. These orders are ordered manually by the dealerships. As the demand in the aftermarket is highly volatile, it requires more local warehouses that can quickly satisfy the demand. Hence, the SDCs are strategically located to efficiently support the dealers with these orders. Moreover, "vehicle off road" (VOR) orders are the emergency orders that require the parts to be at the dealer's location as soon as possible. As the truck industry is moving towards service agreements with 100 percent uptime, this flow of spare parts has become very important. The forward flow of spare parts is illustrated in figure 11 to show how the goods are moving from the DCs to the customer.

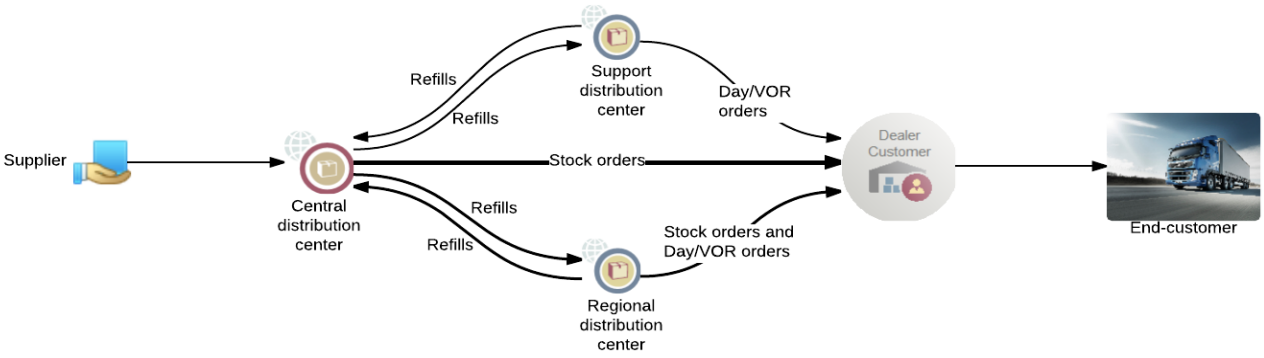

Figure 11. The replenishment setup for spare parts

Moreover, the distribution between the warehouses is handled through internal systems that calculate safety stocks and economic order quantities (EOQ). These orders are placed to the CDCs, which supplies the RDCs and SDCs. There is also a flow of goods in the opposite direction when the SDC or the RDC do not sell the product and it is much more efficient to store it at the CDC as illustrated in figure 10. These orders are called refills and they need proper attention to ensure that the expected service levels are reached all the way from the CDCs to the end customer.

The distribution centers are located to support the dealers with parts in a way that can handle the increasing demand on uptime from customers. The locations of the DCs depend mainly on the optimization of lead-times and cost. Looking at figure 12, several CDCs can be identified but depending on how one characterizes a CDC it can differ. This since the distribution centers can sometimes only be a CDC for a certain number of parts, whereas some are CDCs for all parts. This means that VTC/VBC has six CDCs around the world, where some of the RDCs function as CDC for certain parts in areas that the CDCs do not cover. However, a fully operating CDC should carry the full range of products and work as a link between the suppliers, the other DCs and the dealers.

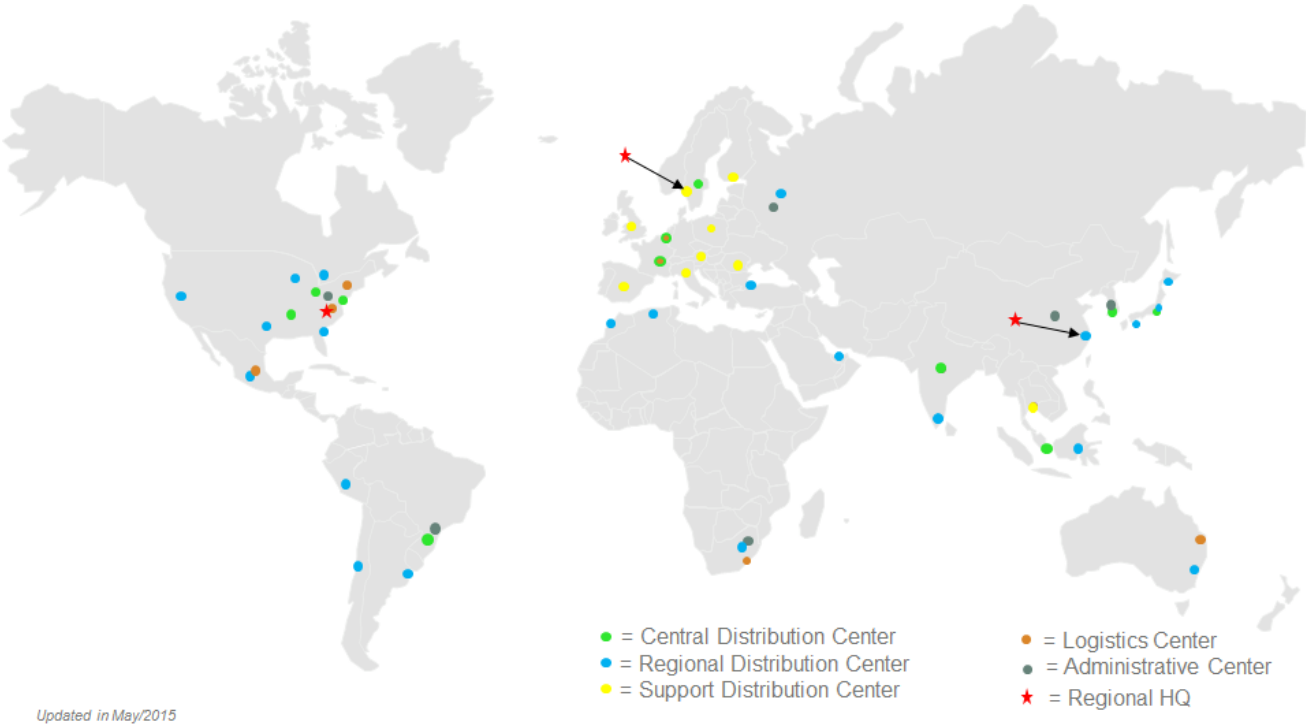

Figure 12. The global location of distribution centers

The distribution network illustrated in figure 12, supplies dealers all over the globe with parts in order to maximize the availability to the end customer. In order to do so, the replenishment is partly steered by the Materials Management (MM) department at VTC/VBC and partly by the dealers.

4.1.2.1 Inventory management

VTC/VBC has established a dealer inventory management (DIM) group that is responsible for replenishing the stock orders and this order type constitute for the largest part of the dealer inventories. In Europe, around 97 percent of the dealers allow VTC/VBC to centrally steer parts of their inventory. The percentage is not as high for the rest of the world but the long-term plan is that MM will steer most of the dealers' inventories. Currently, VTC/VBC owns approximately 30 percent of the dealers in Europe and this is one reason why the share of dealers using this setting is higher in Europe compared to the rest of the world. The reason for initiating this concept was that during 1990's the availability of spare parts at the dealers was seen as inadequate and were not meeting the targets set up by VTC/VBC. Through the DIM concept, VTC/VBC are able to control the stock levels and increase the availability, which can increase the sales of spare parts and enhance the customer satisfaction. Another benefit is also that the distribution and handling cost decreases as VTC/VBC are able to plan their upstream activities in a more efficient manner. The foundation of the DIM concept and the underlying reasons for it is described in figure 13.

Figure 13. Foundation of the DIM concept

The fact that Volvo Group is a large and global organization, discussed in chapter *4.1.1 Background of Volvo Group,* has affected how the agreements is set up within the DIM concept. How the DIM concept is set up and what conditions it involves differs depending on the country and the brand. The sales department in the specific country and what kind of agreement that is suitable in that national context often influences the DIM setup. Before initiating the DIM concept, dealers sign an agreement called Logistics Partner Agreement (LPA). The LPA-contract is constructed around three key policies; *Stock holding policy, Refill policy* and *Return policy.*

The *stock holding policy* explains what spare parts should be stocked at the dealer. The parameters affecting this decision are the value of the part and how often they are sold at the dealer. Depending on these two parameters, e.g. a low-value product that is sold once within in a specific time-frame will be qualified for automatic replenishment whereas a high-value product needs to be sold five times to qualify for automatic replenishment. Dealers operating under the LPA-contract still have the possibility to order parts manually through day and VOR orders. Parts that are usually ordered manually are expensive parts, parts that are not selling enough to qualify for automatic replenishment, parts that the dealer blocked due to that they want to control the replenishment themselves and parts with uneven demand. In addition, the dealers still have the option to replenish their stock with parts that are qualified for automatic replenishment if they consider it necessary. The ownership of the product works however in the same way. Both when parts are automatically replenished by VTC/VBC and when dealers order manually the dealer owns the product as soon as it is delivered. This means that dealers are paying VTC/VBC for products even though they have not been involved in the ordering process.

The automatic replenishment is controlled through an IT-system called DSP. The dealers have the responsibility to provide MM with sales data, demand patterns, stock balance etc. that is then entered into the DSP by MM. Moreover, dealers could handle the process of updating the information either manually or automatically. A large share of the dealers is using the Global Dealer System (GDS) where their stock levels are automatically sent to the DSP. The frequency of how often the dealer needs to send data to MM is depending on the size of the dealer. If it is a smaller dealer then they

provide MM with data once a week, whereas larger dealers are sending data on a daily basis. The data is then used to calculate forecasts and filters and implement security checks in order to ensure that healthy stock is kept at the dealer, which is imperative for the *refill policy*.

The *refill policy* determines how much that needs to be ordered at each occasion. This is determined by factors such as the total cost of inventory, the stock holding cost and the ordering cost in order to calculate the appropriate EOQ and the re-ordering point (ROP) for each dealer. In the beginning of each year, a forecast is created to see what needs to be replenished and when. This forecast is based on e.g. previous year's sales, trends, seasonal variations etc., which then sets the foundation for the EOQ and ROP. During the year, the EOQ and ROP could change depending on how the forecast change due to the data input from the dealerships. Spare parts are difficult to forecast due to their unpredictable demand and since the stock levels cannot be too high. Therefore there is a high risk of returns and a *return policy* is needed.

The *return policy* is partly needed to handle the stochastic factors in the aftermarket. Another reason for the return policy is that if VTC/VBC pushes out spare parts that are not sold, the dealers must be able to return them in order to even out the stock holding risk. VTC/VBC takes on the responsibility to buy back the product when parts are considered to be dead stock and this type of return is called buybacks. If parts are considered dead stock or not, depends on the value of the product and how long it has been at the dealer without being sold. If the dead stock lack demand at other dealers as well will be scrapped due to the low sales frequency and that it is often more economically beneficial to send out a new spare part if the demand re-occurs. In addition to the buybacks, the *return policy* also involves an additional type of return called order-by-mistake. Order-by-mistake means that the dealer have the option to return products within 28 days if they ordered the wrong part or too much of a certain part. The purpose of this return code is that the dealer should not hesitate to order place manual orders in order to minimize the risk of not having available spare parts. Furthermore, dealers that have not signed the LPA-contract also has the possibility to use this return code and currently VTC/VBC lacks measurements in order to follow up these return codes to see that the purpose of the two is meet.

4.1.3 Key Performance indicators at VTC/VBC

In order to track the dealer performance around the world, the dealers need to provide VTC/VBC with large amounts of data. As of today, VTC/VBC have not established any RL KPIs for the aftermarket. As the main focus has been on the forward flow, multiple KPIs have been established within that area instead. Through internal documents and interviews, it became clear that dealer service index (SI) is the most important KPI for VTC/VBC within the aftermarket. The service index at VTC/VBC is calculated on dealer level and only on parts that are included in the forecast, meaning that the parts must have been sold at the dealer during the last year in order to affect the KPI. This means that the true service level is not measured, since it does not include how much of the parts that was sold directly from stock. As the core purpose of the analyzed returns is to increase the availability, the current service index makes it difficult to measure how it affects the actual availability at dealers. Therefore, to understand situation, several other measurements has to be considered when evaluating dealer performance and how returns affect this.

In order to measure the dealer performance, VTC/VBC have established KPIs that are tracking inventories, order patterns and sales. Through KPIs like *% healthy stock*, *turnover rate* and *% auto stock,* VTC/VBC are able to constantly track dealer inventories in order to maintain good performance. *% healthy stock* means that the part has been sold during the last year, while *% auto stock* tells how much of the inventory that has been automatically refilled by VTC/VBC's DIM concept. To ensure that dealers are not using the ordering system in a way that only suits their own interest, the order pattern is tracked by measuring the *share of day/VOR-orders.* As VTC/VBC is controlling the dealer inventory, the goal is to have as much *auto stock* and as little *share of day/VOR-orders* as possible. As dealers are constantly tracked centrally from VTC/VBC, their goal is to show good numbers while not adventuring customer service.

4.1.4 Reverse logistics within VTC/VBC

RL has not received much attention internally at VTC/VBC. This is a result from that no or few resources have been allocated to the area. Large flows of returns from dealers back to VTC/VBC have become costly and unmonitored since the focus has been to reduce costs in the forward flow without jeopardizing service levels and customer satisfaction. As of today, no KPIs, incentives or penalties are currently connected to returns and VTC/VBC takes the responsibility for all costs involved, e.g. transportation, handling and administration. Furthermore, in order to separate between different reasons for returns, VTC/VBC has established seven return codes described in figure 14.

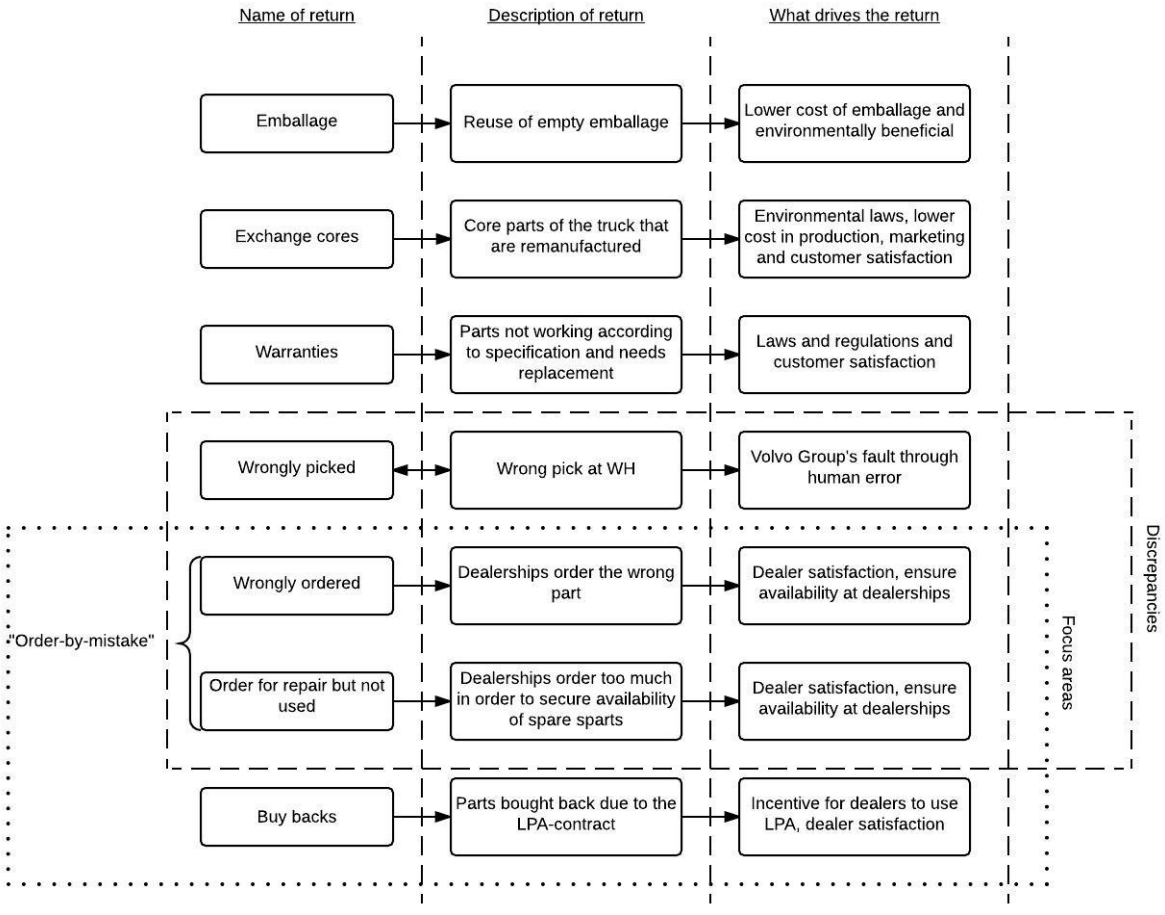

Figure 14. Overview of return flows at VTC/VBC

Exchange cores are the core parts of the truck that are economically beneficial to remanufacture and re-distribute to customers. The remanufacturing of components is outsourced, which means that an additional actor is involved in these returns. The complexity increases even more as the lead-time and visibility of these parts is crucial due to that the remanufacturing facility plans the production according to when they are planned to be returned. *The emballage* at VTC/VBC is moved in a closed loop supply chain in order to reuse them and minimize cost of using new emballage. The returned emballage occurs when parts are being shipped out to dealers or between DC's and the empty emballage needs to go upstream in the chain to be used for other parts. Moreover, *warranties* are a category for products that break before the warranty expires. In this flow, it is imperative that the parts are returned quickly before the warranty runs out or there might be discussions if the warranty applies or not. In the *wrongly picked* category, spare parts are either not delivered in the right quantity or they are damaged before delivery. Moreover, as the focus of the thesis is on the order-by-mistake and buyback returns, the process of collecting and processing will only involve these return codes.

The first step of collecting the returns is both initiated by VTC/VBC and dealers depending on the return code. It is important to distinguish between that the buybacks are initiated by VTC/VBC, whereas dealers initiate the order-by-mistake returns. The returns are however generally shipped by road to reduce costs and the largest share is received centrally in the CDC.

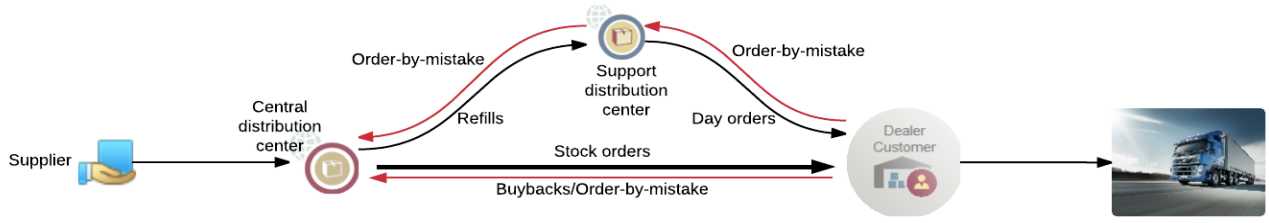

Figure 15. A generalized illustration of the forward and returns flow for order-by-mistake and buybacks

As seen in figure 15, the flow of order-by-mistake and buyback returns differ as buybacks are always sent back to the CDC, whereas the order-by-mistakes are sent back to the origin from where it was sent from, usually the SDCs. As the SDC may be refilled during the time when dealers possess the spare part, the SDC may not want to stock the spare part and can choose to pass it on to the CDC. Transportation cost is mainly affected by the weight of the returns with some exceptions where volume also can affect the price and the transportation is always handled by a 3PL. As dealers book the transport, they are also the ones registering how much weight that should be transported. As of today, many dealers do not possess any weighing equipment, which forces them to estimate the weight that in turn can affects the price of the transport negatively. During the transportation of returns, there are no track and trace systems integrated with the carriers, making it difficult for VTC/VBC to plan for the arrival.

The second step of the return process is when the returns arrive at a DC, which involves a first inspection where the parts are approved or not. For example, at the CDC in Gent, there are 12 designated employees only handling the returns. The parts are processed through either reuse, refurbishing or scrap. What affects the cost of handling returns is mainly the number of order lines,

which means the weight is not the driver of cost in this step of the process. To further increase the understanding of the processes for order-by-mistakes and buybacks, they are described more in detail in the next section.

4.1.4.1 The processes of order-by-mistake and buyback returns

In this section the two focused return categories will be described, which in the end will be compared to Renault's processes on a high-level. The purpose of this section is to provide the reader with an understanding how the processes works and why they occur.

The process of "Order-by-mistake"

The order-by-mistake returns derive from the manually ordered parts described in chapter *4.1.2.1 Inventory Management.* Within this category there are two different return reasons: parts wrongly ordered and parts ordered for repair but not used and the largest return reason is parts that are ordered for repair but not used. The purpose of this return category is to allow for the dealer to have the right parts before the customer arrives without increasing their stock levels and as a consequence they are able to return parts if they were not needed for the repair.

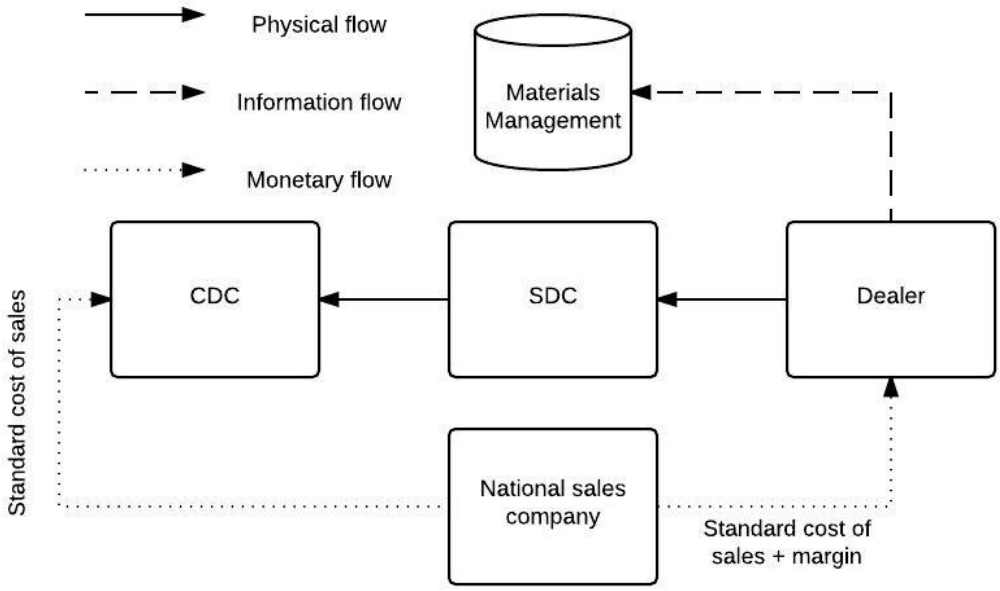

Figure 16. Overview of the different flows within the "order-by-mistake" process

When the dealer orders a part manually, they have generally 28 days to return the part to get 100 percent refund and this monetary flow is visualized in figure 16. The process of an order-by-mistake return is initiated when the dealer enters the part into the VF05-system that is connected to the GDS-system. The system automatically creates a return authorization if the part is meeting the criteria for order-by-mistake return, see figure 15. The criterion is generally that the product value must exceed 350 SEK and received at the dealer within the 28 days timeframe. Moreover, the GDS-system also generates a list called the 28 days-list that is sent out weekly to tell the dealer which parts they have in inventory that could be returned in the order-by-mistake category.

When the return is initiated, the dealer picks and packs the parts and the return authorization usually takes a day. When the packing is finished, the dealer contacts the carrier and arranges for transportation, which usually happens the day after. These parts are then transported back to the DC where the parts originated from, and the reason for this is for the DC to investigate why it was sent back and if there were any problem at the DC causing the return. If the part is needed at the DC and is in a condition to be sold to another dealer it will be re-inserted in the forward flow and the personnel at the DCs has a target of 5 days to handle an order-by-mistake return. When the return is accepted and the case is closed, the national sales company for each country is the one who initiates a credit to the dealer see figure 16.

The process of buybacks

As mentioned in chapter *4.1.2.1 Inventory management,* buyback returns is a consequence of the DIM concept and the returns are initiated due to what is stated in the stock holding policy. This process is a bit more complex than the order-by-mistake process and it therefore needs a more thorough explanation. The buyback process is divided in four different phases with different activities at both VTC/VBC and the dealer, see figure 17.

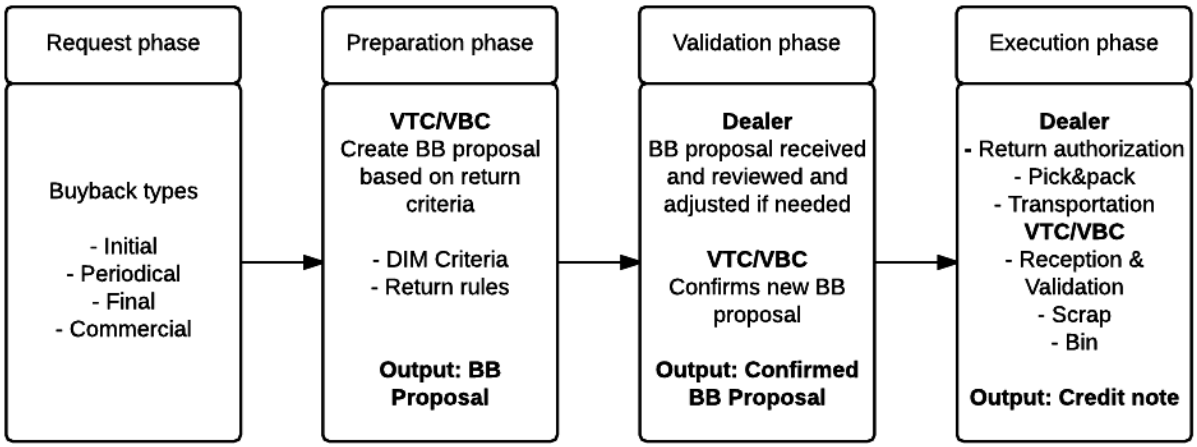

Figure 17. General description of the buyback process

The request phase is the first step in the buyback process. In this phase it is decided what kind of buyback that is required. An *initial buyback* is the first buyback that occurs when a dealer enters the LPA-contract. It means that the MM department evaluates the current stock at the dealer and then takes on the responsibility to buyback all the products that are stocked at the dealer but not considered healthy stock. The consequence is that the first buyback often contains a large number of products as the stock levels at the dealerships are higher than what is considered healthy stock levels. A *periodical buyback* is the most common buyback and this is the one that occurs on regular basis to make sure that dealers' stock levels are consistently healthy. These buybacks are planned on a yearly basis in order to facilitate the operations at MM and also make sure that the incoming buybacks at the CDC is smoothened out to facilitate the planning of handling the returns. The number of periodical buybacks performed at dealers range between one to nine times a year with an average of three times a year in Sweden. How many buyback each individual dealer should perform is usually based on the size and sales of that particular dealer and currently there is no lower or upper limit steering how many buybacks that should be performed per year. A *final buyback* occurs when a dealer that is

under the LPA-contract goes out of business. The entire stock that is left at the dealer is then bought back by VTC/VBC and the refund is depending on the percentage of automatically replenished parts contra the manually replenished parts. The last type of buyback is called *commercial buyback* and is initiated by the dealer and accepted by the sales company for the concerned country. These kinds of buybacks are usually done to secure a high dealer satisfaction if the dealer e.g. feels that they carry too much stock or that the demand patterns are changing.

The preparation phase is when the DSP-system prepares a buyback proposal for each individual dealer. Which parts that qualify for a buyback is decided based on the value of the product and number of picks. For example, if the value of an order line is more than 300 SEK it needs to be in stock for one year before considered dead stock and if the value is less than 300 SEK and it has been in stock for more than two years, it is considered dead stock. If there is still a demand for the dead stock, the parts will be re-inserted in the forward flow when returned back to the CDC. In both of these two cases, VTC/VBC compensates the dealer. The degree of compensation depends on if the part has been automatically or manually replenished and generally VTC/VBC compensates the dealer 100% for the automatically replenished parts and 50% for manually ordered parts. In addition, there has to be at least 30 order lines in order for the system to initiate a buyback otherwise it will wait until the next buyback occasion. This process is handled automatically by the system and the proposal is sent as an email out to the dealer, see figure 17. The DSP-system takes into consideration the numbers of products that will be bought back to prevent volatile return flows to the CDC. This will facilitate easier planning at the CDC in order for the handling process to be as efficient as possible. Therefore the buybacks are not performed at a regional level for each country, they are performed in a way to smoothen out the return flows. From the date that the buyback is initiated by the DSP-system, the dealer has 30 days to send the products back to the CDC in Gent. The buyback proposal is divided into three categories; automatic buybacks, manual buybacks and scrap and the dealer has the option of sending all the products back that are in the proposal or they can make adjustments if needed.

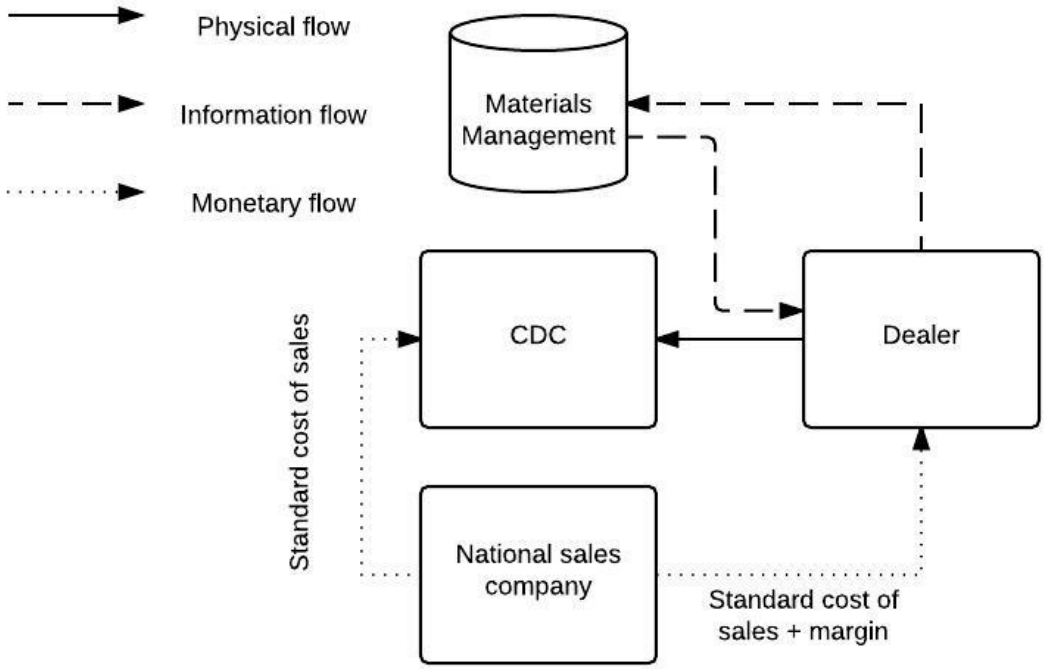

Figure 18. Overview of the different flows within the buyback process

After this phase, the buyback processes enters the *validation phase*. The dealer then informs MM if they accepted the buyback proposal or if they have adjusted it, see figure 18. Often the dealer only adjusts the quantities when products are defect or broken and they will not get refunded for these products and hence, they examine the parts carefully before sending them back.

When the confirmed buyback proposal is handled and accepted, the *execution phase* is initiated. The DSP-system then creates a return authorization document that is sent to the dealer. In this document all the administrative information that is needed to send the products back to the CDC is stated such as quantity, toll authorization etc. When the dealer has received the return authorization they have the responsibility to pick and pack the concerned products in one of VTC/VBC own emballage and make it ready for transportation. The pick and pack operation is often carried out before the return authorization is received in order to facilitate and speed up the process. The dealers also have the responsibility of contacting the carrier and initiate the transport. The buybacked parts are then always transported to the CDC. The parts arrive in a container and the designated personnel go through all the parcels to make sure that there are no missing parts. From arrival at the CDC to the creation of a credit note to the dealer the return personnel has a target level of 10 days. The buyback that is sent as scrap from the dealer will go straight to the bin after the quantity of the incoming scrap is inspected. When the handling process of the returns are finished and the products are re-inserted in the forward flow the customer will be credited, and the time from initiation at the dealer to the creation of a credit note at the CDC could range between 4 - 28 weeks. The national sales companies are responsible for the refund and they are the ones that transfer the money back to the dealer, see figure 18. It was found that these return codes exists within other companies in the Volvo Group, however some differences were identified and they are explained in the section below.

4.1.4.2 Brief comparison between VTC/VBCs and Renaults return processes

Looking from an operational perspective for the respective return codes, the processes are similar. Renault recently started to use the LPA-concept and as a consequence they are buying back dead stock from the dealers. The dealer books the transportation and the buyback proposal and the return authorization is issued automatically through Renault's internal IT-system, similar to VTC/VBC. However, when looking at the policies for returns and what could be returned or not, differences were identified. In the buyback concept, Renault has a much higher lower limit of 1750 SEK when it comes to what qualifies for a buyback in terms of value. However, this amount can differ depending on the country as the market department in each country can have different agreements with the customers. The difference is similar for the order-by-mistake category where Renault has a limit of 750 SEK whereas VTC/VBC have 350 SEK. This limits the amount of parts that qualify for a return. Moreover, Renault can refuse an order-by-mistake if their CDC in Lyon is carrying too much stock of that specific part, which also differs from VTC/VBC's policies.

Renault has similar quality inspections procedures as VTC/VBC both at the dealers and in the CDC. However, when it comes to a dual-dealer that sells both VTC/VBC and Renault there is a tendency that the dealer follows VTC/VBC procedures which could cause problems as the accepted quality levels is not exactly the same at each brand. Therefore, Renault often experience that returns get refused due to quality issues. This has caused Renault to investigate and improve the procedure for the dealers to determine if the part meets the quality targets or not. Renault are planning to more thoroughly describe what quality that is expected by adding picture and an explaining text to the document each dealer receives with rules and policies of a return.

4.2 Current situation of returns within VTC/VBC

When initiating this project, one of the major challenges was that VTC/VBC did not have an overview of the current return situation in terms of volume, value or weight. This will be described in this section, where both the European and more thoroughly the Swedish return situation will be described. Both qualitative and quantitative data gathered from interviews, direct observations and internal documents is also provided to show that there are no clear trends or patterns how parts are returned currently. Moreover, there are large variations in how much dealers return both on a European and on a Swedish level and the complexity of the different markets are therefore explained. The purpose of this is to answer research question one in order to facilitate the answering of research question two and three.

4.2.1 The VTC/VBC aftermarket context

The aftermarket within the automotive industry is well known to be one of the largest contributors to the overall profit. There is no difference for VTC/VBC, where the margins on spare parts are very high. Therefore, the focus on selling spare parts has exponentially increased over the years, which forced new solutions both in how the vehicles are sold and how the spare parts are distributed. The aftermarket has moved towards offering customers uptime and the way service and maintenance is handled have changed. The nature of a truck implies that parts are breaking in different stages of the product life cycle, which makes it unpredictable but the maintenance and repair can be categorized into two areas; preventive and corrective as shown in table 4.

Table 4. Preventive and corrective maintenance

Type of maintenance	Characteristics	Planning	Supply
Preventive	• Less costly • Less downtime for vehicle owner • Less volatile demand	• Easier to plan for • Connected vehicles enable better planning	• Mainly stock-orders • Less emergency orders
Corrective	• Costly • Longer down-time for vehicle owner • Volatile demand	• Difficult to plan for • Connected vehicles can foresee breakdowns	• Mainly day-orders • Expensive emergency orders

VTC/VBC are known to offer technologically advanced products and connected vehicles are something that is an important aspect on the agenda within the company. This new technology helps the company to foresee the events of breakdowns and can hence increase the preventive measures to avoid downtime of the customers' trucks. Through connected vehicles, they are able to gather valuable vehicle data that can further improve the service and making the customers more likely to choose VTC/VBC repair and maintenance services rather than other independent players.

As VTC/VBC is focusing on locking in customers to prevent them from using the alternative market for repair and maintenance, controlling the aftermarket is highly important. By doing this, the company is able to ensure the quality of their vehicles, while reducing the number of competitors within the market. The strategy of offering 100 percent uptime through contractual agreements with customers is one way for VTC/VBC to make sure that "fake parts" are not used in their vehicles. The contracts; gold, silver, blue and classic blue have been developed to offer customers different options to a fixed cost per year where they can benefit from free repairs and maintenance to certain degrees depending on the chosen contract. The gold contract is the most comprehensive one where VTC/VBC promises their customers 100 percent uptime through remotely monitored vehicles that gives dealers the status on crucial components while the vehicle is on the road. The other contracts are cheaper and involve fewer benefits where the silver contract is the second most expensive one and the blue is the cheapest one, which is further divided into blue and classic blue. To give an example on the distribution between the different contracts, data was gathered for the Nordics where around 10% of the customers have service contracts. This is compiled in figure 19.

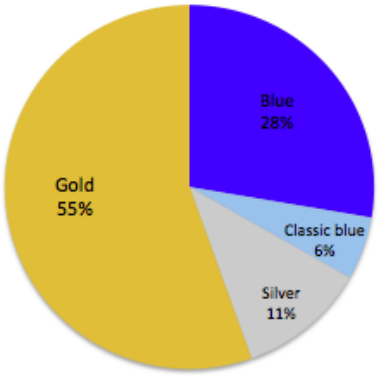

Figure 19. Distribution of contracts in the Nordics

As the largest share of contract holders is gold contracts, this adds pressure to VTC/VBC to ensure availability of parts and uptime of the vehicles. If the spare parts are not available at the dealer and the lead-time of replenishing the spare part stock is too long there is a risk that the customer will fix their truck somewhere else. As VTC/VBC cannot compete on price with these low-price alternatives their competitive advantage lies in service and availability of spare parts. Hence, dealers must be able to take responsive measures towards urgent customer demands, which in turn create a need for return flows in order to keep low stock levels while offering high availability.

4.2.2 As-is situation for returns on a European level

The gathered data showed that the average percentage of returns is 6,06 percent calculated by taking the total value of returned spare parts divided by the total value of sales. The return rate that is calculated is on all returned parts within VTC/VBC except for exchange cores, emballage and refills between the DCs. The average return flow differs very much from country to country, which is illustrated below in figure 20 where the goods that are distributed to a country, are returned back to the warehouse through the included return codes described in chapter *4.1.3 Reverse logistics within VTC/VBC*. Inmar Reverse logistics (2009) states that an industry average for returns is 9,7 percent in the automotive aftermarket. However, this was including 50 percent cores that are outside the scope and data collected and therefore, 5 percent is considered to be an industry average for the return codes in focus and therefore 4 - 6 percent was considered to be sufficient. In the map, countries marked with dark red is considered to have a high return rate, pink is mid/high, yellow is mid/low and green is considered to be low.

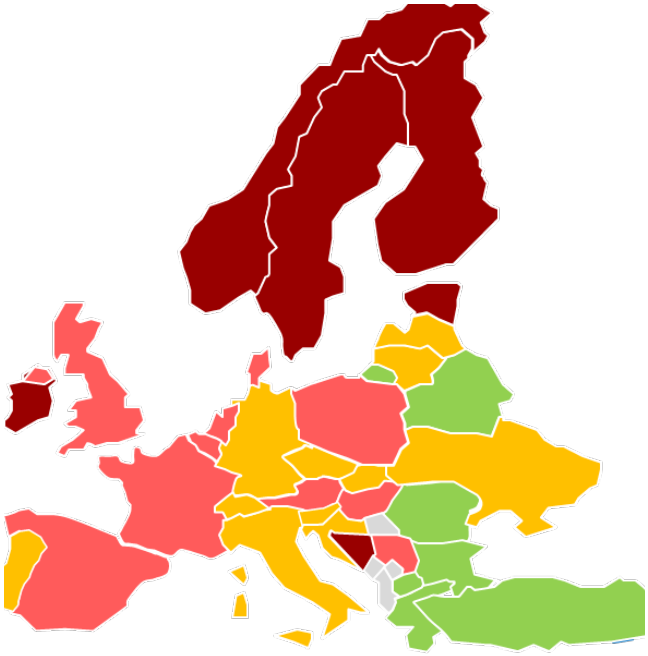

Figure 20. Europe map illustrating the spare parts returns

Furthermore, the map shows that Europe and especially the Nordic countries are the largest contributors to the return flow. These countries are also large markets for VTC/VBC, meaning that the number of products returned is also high compared to the rest of the world, which is further illustrated in figure 21. The illustration shows that the largest markets for Europe within the aftermarket for VTC/VBC.

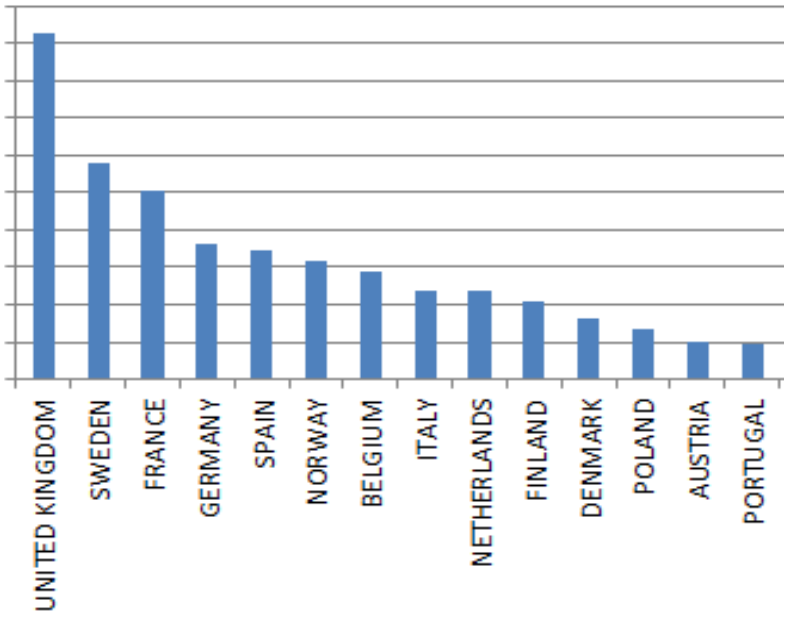

Figure 21. Illustrating % of total sales for countries in Europe

Moreover, the buybacks and the "order-by-mistake" return codes are the largest contributors to the flow of returned goods in Europe and they contribute to approximately 88 percent, see figure 22.

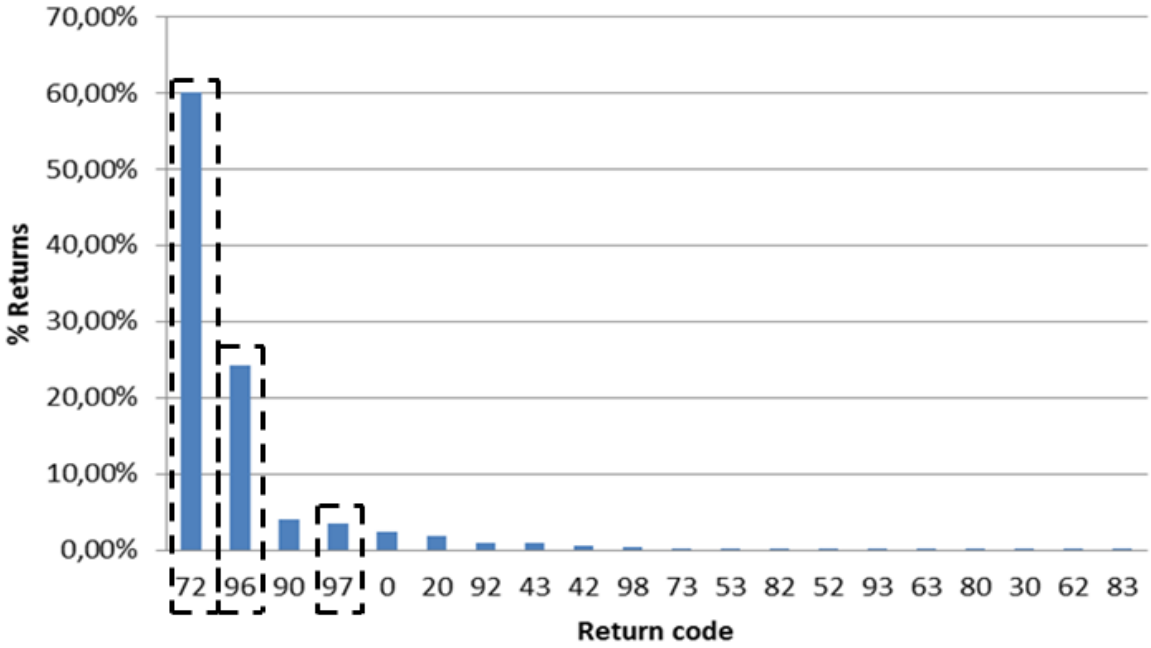

Figure 22. Distribution of return codes on a European level

Code 72 is the order-by-mistake category, code 96 is the buyback category and code 97 is the buybacks that are sent back as scrap. The other return codes are mainly quality related and not initiated on purpose from either VTC/VBC or the dealer. Moreover, the relationship between buybacks and order-by mistakes varies from country-to-country and in e.g. Sweden they contribute to almost 90 percent of the total returns.

4.2.3 The Swedish market context

As this report is analyzing the RL with focus on Europe and especially the Swedish market, the characteristics of this market needs to be further explained. The aftermarket in Europe is imperative for VTC/VBC and in 2015, around 55,7 percent of the aftermarket sales came from Europe where Sweden was the second largest market after United Kingdom. In Sweden there are approximately 100 dealers and most of them are located in the middle and south of Sweden. The dealer base in Sweden is quite diverse where there are some large dealer groups that owns several dealerships e.g. Finnveden Group and Rejmes Group. Furthermore, VTC/VBC also own several dealers in Sweden and the rest of the dealers are smaller independent dealerships.

In Sweden there are a lot of different customers ranging from large transport companies like DHL and Schenker with a large amount of trucks down to smaller carriers with one to two trucks. The type of trucks that they use and what they use them for is also widely different. Some trucks are used for long hauls, whereas others are only used for shorter distances with higher frequency. As a consequence, the customers have different needs and puts different amount of pressure on dealers when it comes to the availability of spare parts. If a truck of a smaller carriers breaks down it can mean that their entire business will fall, whereas for e.g. DHL they have spare trucks that could be used, which can reduce the urgency. Currently there is no data showing what kind of customers is going to a certain dealer, but a general opinion is that the customer base is widely spread at each dealer.

In Sweden, around 10 percent of the customers are under some kind of service agreement and as shown in chapter *4.2.1 The VTC/VBC aftermarket context* 55 percent of these are gold contracts in the Nordic countries. The distribution of contracts is similar in Sweden, which means that approximately 5 percent of the Swedish customers are under gold contracts. These customers are often in a better financial situation compared to others as they can afford a gold contract. A consequence of this is that their trucks are serviced more often with a fixed interval and the probability of unexpected breakdowns becomes much smaller.

The cost of repairing a vehicle in Sweden is however much higher compared to the rest of Europe as the vehicles are in general newer and more complex. Moreover, the cost of uptime/vehicle is much higher in Sweden, which increases the pressure on dealers to have the right parts in stock before broken vehicles arrive. Therefore, the availability of spare parts is of high importance and it becomes difficult and complex to handle it in a context with advanced trucks and different customer demands. Moreover, the delivery precision from the CDC in Gent to Swedish dealers was identified to be unstable in combination with long lead-times, the dealers tend to order more day-orders. VTC/VBC has a targeted lead-time of 7 days from initiation of a stock order to arrival at the dealerships. As this lead-time varies, it becomes more difficult for the dealers to plan their maintenance. A consequence of these factors is that the return flows might increase since the dealers must stock a wider range of parts compared to the dealers in the rest of the world and diagnosing the vehicle is much more difficult. To summarize the complexity of the Swedish market, it is mainly driven by large differences in customers and vehicles, complex customer needs and logistic challenges creating the need for RL.

4.2.3.1 Reverse logistics for the Swedish market

There are several factors influencing the returns in Sweden. Among others, the relocation of the Swedish SDC from Gothenburg to Eskilstuna caused a lot of problems with deliveries, which in turn led to an increased amount of returns. It was furthermore identified the returns vs. sales is widely different for dealers in Sweden, which indicates that there are more factors affecting the returns than just the country context in which the dealer operates in. The percentage return vs. sales for the 22 biggest dealers in Sweden is illustrated in figure 23 where the blue bar is percentage returns versus sales and the red bar is the percentage of total sales, i.e. how large the dealer is.

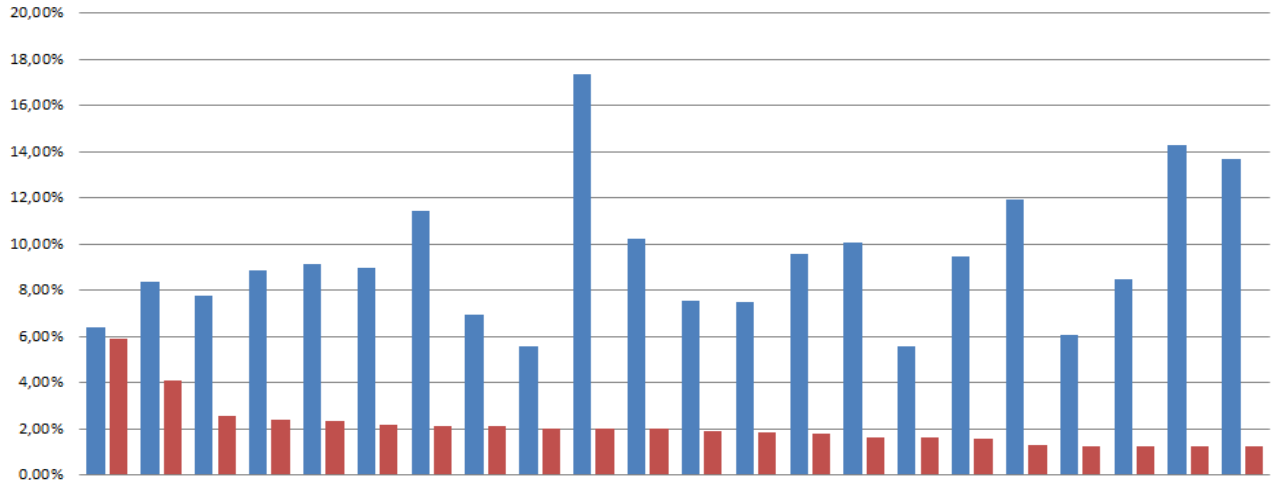

Figure 23. The % returns vs. sales for the 22 largest dealers in Sweden

As seen in figure 23, the percentage returns vs. sales range from ~5 percent to ~18 percent, which further indicates that the dealer itself is a significant contributor to the flow of returns and not just VTC/VBC. Interviews were conducted with dealers on both sides of the spectrum to identify the root cause to either good or bad results. Differences in planning capabilities, mentality towards returning spare parts and inventory management were among other reasons that can affect the amount of returns but no root cause in itself was identified. However, it was seen that for a good performing dealer from a return perspective, the other KPIs were not affected negatively, see table 5.

Table 5. Showing best-in-class dealer

KPIs	Benchmarked dealer	Average in Sweden
Returns	5,59%	9,64%
Total percentage of Sweden sales	2,02%	0,99%
Share of day/VOR-orders	32,74%	39,72%
Percentage 72 vs. sales	2,80%	6,32%
Percentage 96 vs. sales	1,92%	2,58%
TOR Tot Man	6,21	6,99
TOR Tot Auto	4,76	4,03
Overstock	2,86%	5,00%
Dead stock	5,39%	7,30%
Service index	94,04%	89,96%
Healthy stock	91,75%	87,78%
Number of BB occasions	7	3,27
Stock auto	69,18%	72,60%

As seen in table 5, it is possible for a dealer to have a significantly lower return rate than the Swedish average and still perform well when looking at the other KPIs that are currently measured at VTC/VBC. The same analysis was conducted at several other dealers and no clear trends were identified between what is considered good performance and the return rate. The dealer in table 5 is returning much less spare parts in the order-by-mistake category compared to other dealers in Sweden, while placing less day-orders. This indicates that this dealer cost VTC/VBC much less money to serve compared to the average while still providing excellent customer service towards the end-customer.

As-is situation for order-by-mistake Sweden

In 2015 64 percent of the returned value in Sweden derived from the order-by-mistake category. Looking at a general dealer level, when comparing all dealers with each other, it was evident that some dealers contributed more to this category than others, see figure 24.

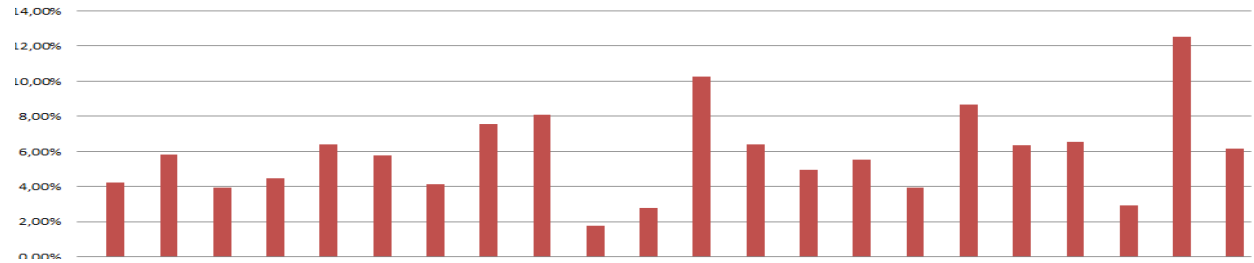

Figure 24. % order-by-mistake of total sales for the 22 biggest dealers in Sweden

Variations in dealer size, ordering behavior, the ordering process and location of dealerships were identified as factors that can affect the number of order-by-mistakes. This is also the case within large dealer groups like Finnveden Group and Rejmes Group, which makes it evident that there are different factors affecting how much that is sent in return. Furthermore, when comparing dealers only selling buses with the other dealers it became evident that the dealers only selling buses are returning less in the "order-by-mistake" category.

As-is situation for buybacks in Sweden

In 2015, 27 percent of the total returned value in Sweden was buybacks. Similar to the "order-by-mistake" category there is variation among the dealerships, see figure 25.

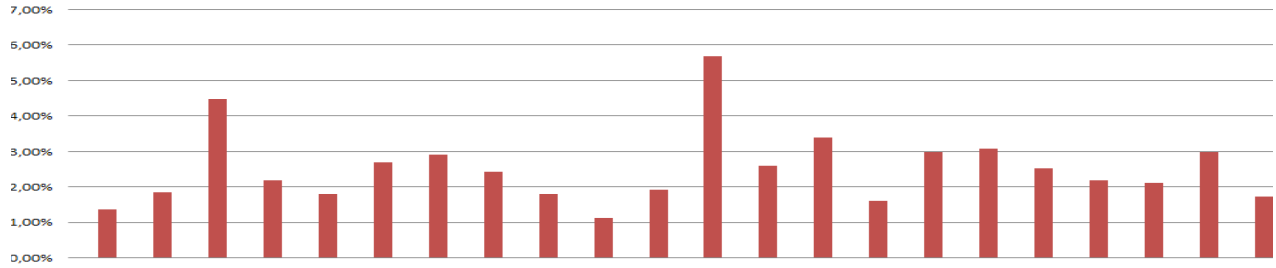

Figure 25. % buybacks of total the sales for the 22 biggest dealers in Sweden

Some identified reasons for variations in this return category could depend on the amount of parts qualifying for manual buyback and in Sweden an average of 38 percent were manual buybacks. It could also depend on that it is more difficult to forecast the demand for some dealers compared to others. Moreover, the value and weight of the buybacks is in general much lower than "order-by-mistake", however when looking at the number of lines, buybacks accounts for the largest part. Just looking at the number of lines sent as LPA scrap, they contributed to almost 25 percent of the total returned lines in Sweden. None of the above-discussed return categories are currently measured within VTC/VBC since they only measure on the forward flow. Moreover, there are several challenges and consequences created by theses two return codes and they will be described in the next section.

4.2.4 Consequences and challenges of returns within VTC/VBC

In order to describe how returns affect VTC/VBC negatively, this part aims to describe consequences and challenges both from a general point of view and also more in-depth for the two analyzed return codes.

4.2.4.1 General consequences of returns within VTC/VBC

One of the largest consequences of returns is that it generates a lot of cost for VTC/VBC in both focused return categories. In a perfect setup, VTC/VBC would not have any returns and therefore only have one handling cost at the CDC and one transportation cost to the dealer. The costs of returning products are visualized in figure 26 and the costs that will be extinguished if the amount of returns is reduced are marked with red crosses.

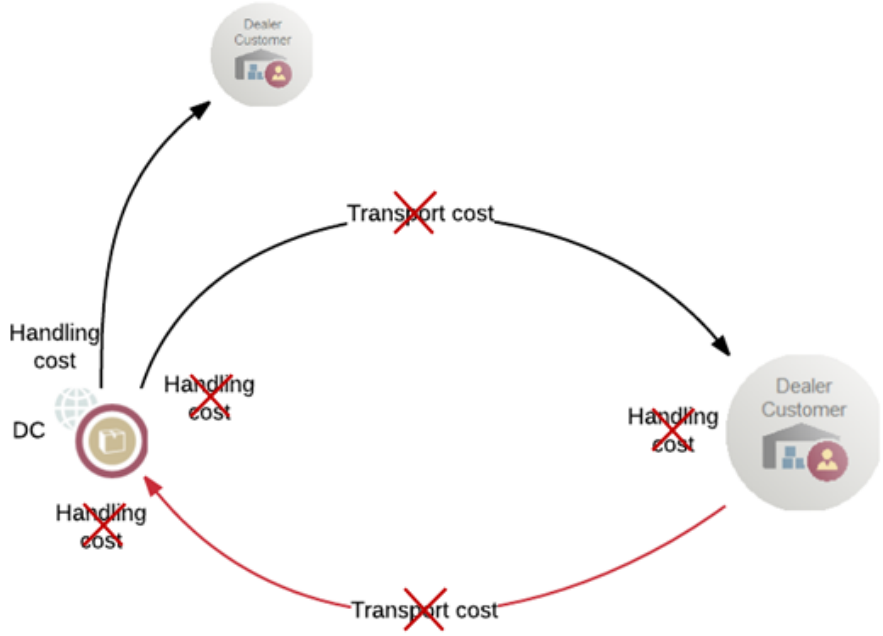

Figure 26. Illustration of unnecessary cost of returns

The current state of the reverse flow at VTC/VBC and the dealerships involves multiple steps. The initial phase is the handling cost of outbound goods at the DC followed by an outbound transportation cost out to the dealer. These two costs differ significantly depending on the order type. A stock order is generally 3 times as cheap to handle in the DC compared to a day/VOR-order and the transportation cost is 10 times more expensive for day/VOR-orders compared to stock orders since a large portion the day/VOR orders are transported by air. The second phase is initiated when a part is decided to be returned and as a consequence the dealer will have a handling cost of picking and packing the returning goods. After this is done a return transportation cost and a receiving handling cost in the DC will be added to the total cost for a return. When the product is returned to the DC, it will later be sent out again in the forward flow. A return will therefore include all these unnecessary costs, also illustrated with red crosses in figure 25. Furthermore, the current return situation is affecting the environment negatively since a large share of the distributed parts is eventually returned and it therefore leads to unnecessary transportation. By reducing the number of returns, VTC/VBC can expect both reductions in costs and environmental impact.

Moreover, another large challenge for VTC/VBC is the lack of visibility and measurements as it makes it difficult for both the dealer and VTC/VBC to have an overview of the return situation. This further makes it difficult for VTC/VBC to control and improve their reverse flow of spare parts. Furthermore, the scrap has become a large issue both for dealers and VTC/VBC since products with e.g. a small scratch cannot be sold to another dealer and therefore goes to scrap. In this case, the dealers do not get any compensation and no feedback on why the part was scrapped. This is a consequence of the quality inspection not being as thorough at the dealerships as it is in the DC.

4.2.4.2 Consequences and challenges of order-by-mistakes

As this return category is a consequence of manually ordered parts, the cost of these returns is much higher. Comparing the total cost of order-by-mistake to the total cost of buybacks it was shown that order-by-mistake returns are approximately 30 percent more expensive. This is mainly due that the manually ordered parts is ordered through day/VOR-orders, which is much more expensive compared to stock orders. Moreover, when a day/VOR-order is initiated from the SDCs, it triggers a refill from the CDC in Gent. If the dealer then returns the part within this return category the SDC will have multiple quantities and as a consequence one of the parts could be returned to the CDC to have as a low inventory levels as possible at the SDC.

Furthermore, diagnosing the exact problem of the truck is a large challenge for the dealerships. The customer service representative receiving the call needs to do a qualitative evaluation over the phone of what the problem could be. Figure 27 provides a simplified overview of the ordering process.

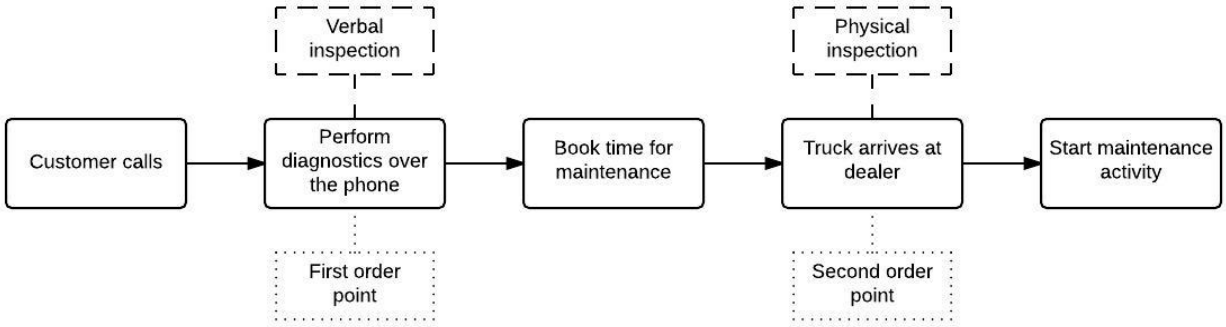

Figure 27. Simplified visualization of the ordering process

Through the interviews and direct observations it was found that the information retrieved from the initial call becomes highly qualitative and depends on the information retrieved from the customer and the experience of the person receiving the call. The diagnostics over the phone can therefore be inadequate so when the vehicles arrive, the right parts are not available. The parts that were not needed for the repair are therefore often returned in the order-by-mistake category.

Another challenge for VTC/VBC is that this return category is highly influenced by the dealerships. As they control both how much manual orders they order and how much they return, this leaves VTC/VBC with few options to control this except from the established return policies. Furthermore, it has been shown through the data that 1 percent of the returned parts in this category will be rejected at the quality inspection in the DC. The consequence will be that the dealer will not get refunded for

these returned parts and the parts are scrapped. This drives additional cost in handling and transportation, which in the end becomes unnecessary. These parts could instead have remained at the dealer as the quality is good enough to use for repairs.

4.2.4.3 Consequences and challenges of buybacks

In this return category a large challenge for VTC/VBC is to set the right replenishment parameters and have an accurate forecast to steer the dealer's inventory. The demand is very difficult to predict and this is one of the main reasons why buybacks exist. Moreover, planning for the return handling of buybacks is also difficult and as a consequence this creates issues further up the chain at the CDC. The plan for the number of incoming buyback order lines and the actual outcome is illustrated in figure 28.

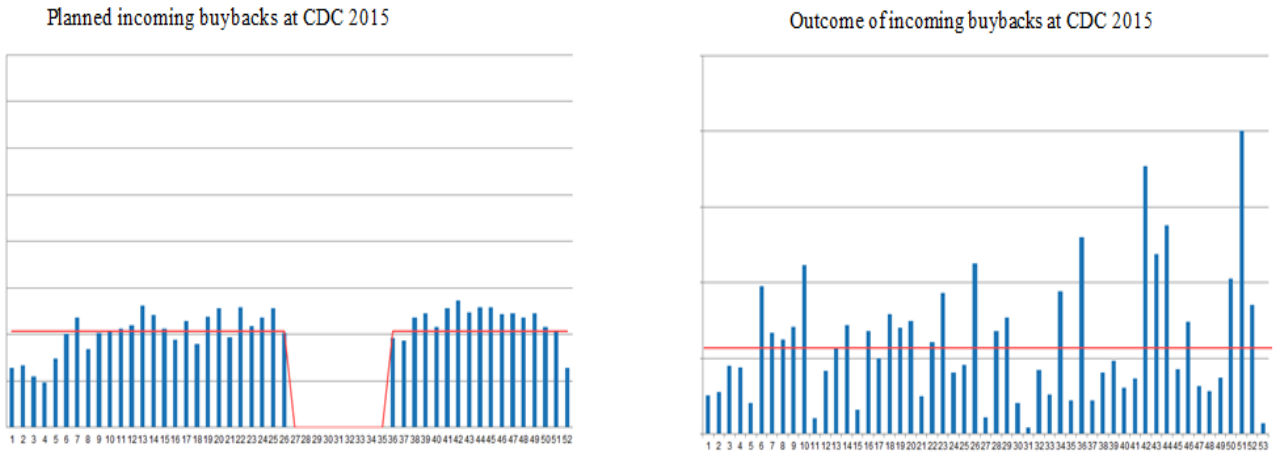

Figure 28. The difference between planned buybacks and the actual outcome at CDC Gent

The variation of incoming orders creates a lot of necessary cost in terms of overtime etc. Another challenge with the buybacks is that the dealers are returning parts that are not meeting the quality standards. It was seen that 4,3 percent of the returned buybacks did not qualify for refund and was therefore scrapped and the dealers were not compensated. This leads to that parts are being transported and handled that in the end are getting scrapped, which is costly for VTC/VBC. Furthermore, the situation in Gent leads to longer time-to-credit for the dealers. Moreover, this could depend on additional factors, such as that the shipments sometimes arrive incomplete at the CDC and the return personnel will not handle goods nor issue a credit note if the shipment received is not matching the quantity initially agreed. Moreover, the order-by-mistake is always higher prioritized than buybacks, which increases the lead-time from arrival in the CDC. This leads to different return handling lead-times depending on the return code, where buybacks generally takes longer time.

Moreover, manually ordered parts that are not returned in the order-by-mistake category and not sold within the timeframe set for buybacks, will eventually qualify for a manual buyback if remained unsold. A consequence of this is that the ordering behavior of dealers could also influence how much parts that will be sent back within the buyback category. It is therefore a challenge to control the ordering behavior in order to reduce the number of manual buybacks. In order to understand why

these return codes occur and what drives them, the identified drivers of RL at VTC/VBC will be compiled in the next section.

4.3 Identifying drivers and compiling them into a framework

When analyzing the empirical findings with the mindset visualized in chapter *3.4 Summary of the theoretical framework* where is shown that several drivers can affect RL, it became evident that this is the case at VTC/VBC as well. A large number of identified areas affecting the amount of returns were compiled in order to find the core reasons to why VTC/VBC are handling a large amount of returns. It was discovered that these could be categorized into five areas, namely the replenishment setup and performance, return policies, aftermarket context and return processes, key performance indicators and dealer behavior and planning capabilities. These key drivers were then compared with the challenges found in the theoretical findings and discussed and validated with interviewees from both VTC/VBC and dealers and these are visualized in figure 29. What was also found was that some areas driving RL found in the empirical findings was not mentioned in the literature, e.g. the behavior of dealers. This was imperative to find and understand both for VTC/VBC as an organization and for the thesis in order to answer research question 2 and facilitate the answering of research question 3.

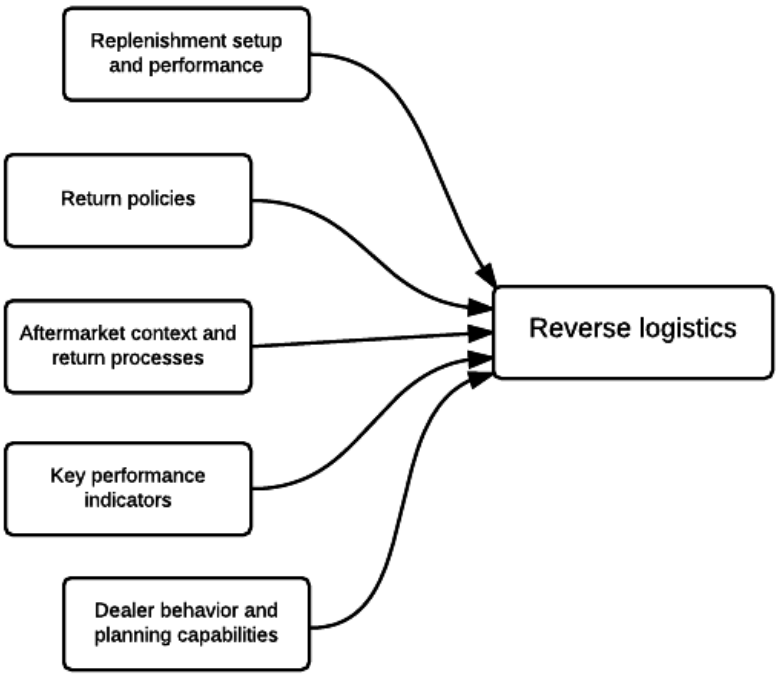

Figure 29. Illustrating drivers of reverse logistics at VTC/VBC

By just identifying the drivers, it is argued that these are difficult to counteract. It was therefore imperative to find the underlying mechanisms for each driver in order to facilitate the process of finding suggestions for improvement. In order to identify these underlying mechanisms, the A3 analysis worked as a conceptual framework for that process. This way of identifying the mechanisms is further illustrated in figure 30.

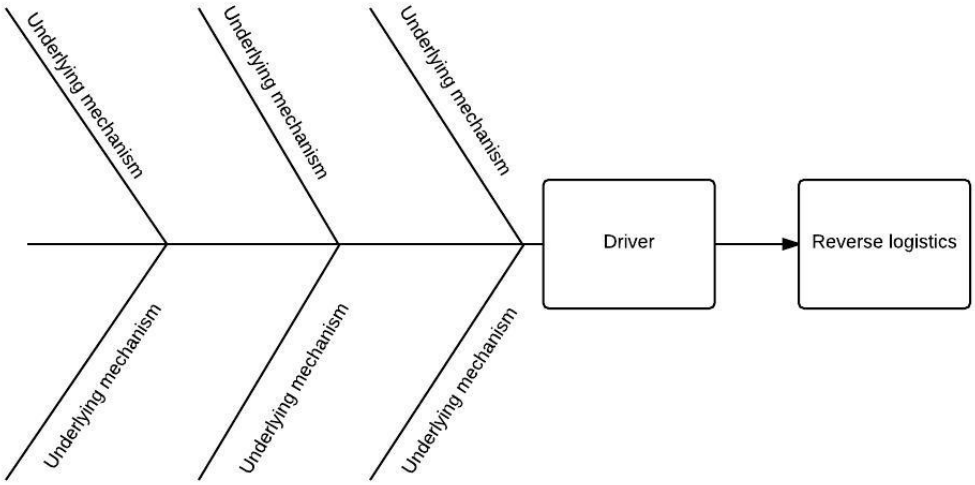

Figure 30. Framework used for the analysis

Moreover, it was also found was that just looking at some underlying mechanisms in isolation did not necessarily create a driver for the RL. However, when several mechanisms happen at the same time, a key driver for RL can be created. This framework is therefore the foundation to how the analysis is structured in chapter *5 Analysis,* where the drivers and their underlying mechanisms are discussed in the first part and appropriate actions for these in the second part.

5 ANALYSIS

Up until this chapter, a framework has been developed to find drivers of RL and their underlying mechanisms both in the empirical and theoretical findings. This logic of analyzing the drivers has been visualized and explained during the thesis. This was in order to facilitate part one of the analysis, where each driver and its underlying mechanisms will be profoundly analyzed. In the end of part one a framework will be presented in order to provide the reader and VTC/VBC with an understanding of the complexity of what is driving RL and who owns the process of improving it. By doing so, it will alleviate part two of the analysis were suggested actions towards the underlying mechanisms will be presented. In part three the initial phase of implementing the suggested actions will be analyzed in order for the reader to understand complications that could arise when initiating change at a large organization such as VTC/VBC.

5.1 Analysis part 1: Drivers and consequences of the RL flow

The importance of the aftermarket has grown during the recent years in several industry and the importance of it cannot be neglected (Saccani *et al*., 2007; Gaiardelli *et al.*, 2006) especially for the automotive aftermarket (Inmar Reverse Logistics, 2009). VTC/VBC is no exception, where large part of their profit comes from this area. The availability of spare parts is highly influencing the customer satisfaction (Syntetos *et al.*, 2012). In the automotive industry, especially for trucks and buses, the uptime of the vehicles is the highest priority as every hour that the vehicle cannot be used is an hour of lost profit for the customer (Makarova *et al.*, 2015). Another contextual parameter that needs to be considered within the aftermarket is handling the different stochastic factors described by Wagner *et al.* (2012), which has forced VTC/VBC to establish a sophisticated and responsive aftermarket supply chain to cope with these issues. In addition, Cohen *et al.* (2006) discuss the differences between a manufacturing and an aftermarket supply chain where an aftermarket supply chain needs to handle e.g. more variations in the product assortment, shorter lead-times and unpredictable demand.

VTC/VBC is not alone in realizing large income and profit from the aftermarket and therefore they also have to be aware of the rising threat of the growing alternative markets where customers can attain the needed spare parts (Wagner *et al.*, 2012). This forces VTC/VBC even more to secure a high service level and availability of spare parts as it has become difficult to compete on price with these actors. This is something that VTC/VBC is highly aware of and the focus at VTC/VBC has been to secure availability of spare parts at any price in order to satisfy the end-customer and ensure the uptime of their vehicles. As a consequence, the cost ends up at VTC/VBC as they offer a replenishment setup with generous return policies to make the dealerships comfortable to place orders without hesitation in order to secure the availability. This can trigger the two return codes focused in the thesis where one is a dealer-initiated return (order-by-mistake) and the other is initiated by VTC/VBC (buybacks).

As the dealer controls the order-by-mistake returns and all the associated costs are covered by VTC/VBC, it can create an undesired dealer behavior. Dealers are currently not incentivized nor motivated to reduce the amount of returns and the only risk that is taken by the dealer is that the parts

returned could be neglected due to quality issues. Therefore a proper return policy should be constructed in a way to share risk between the dealer and the OEM, which is further supported by Kulkarni *et al.* (2015). This is not the case for this return category as VTC/VBC is by far the higher risk-taker as they will pay for all the expenses included. Looking at the buybacks category, the amount of returns is controlled by VTC/VBC and the associated costs of returns ends up at VTC/VBC. The amount of returns is largely depending on parameters steering the replenishment and the forecast accuracy, which could be varying due to the stochastic factors in the aftermarket (Wagner *et al.*, 2012). Hence, controlling the amount of buyback returns in a complex environment like this is a huge challenge for VTC/VBC.

The cost and drivers associated with these two return flows has not been thoroughly investigated before this thesis was initiated, which is supported by Vachon *et al* (2014) as they discuss that most companies sees RL as an necessary evil instead of working actively with it. This is the case at VTC/VBC, where the return flows has gained limited attention and the area is considered somewhat of a black hole in the organization. Therefore, it is of high importance to increase the knowledge about the area and show the different drivers affecting the returns and these will be further analyzed in the coming sections, see figure 31.

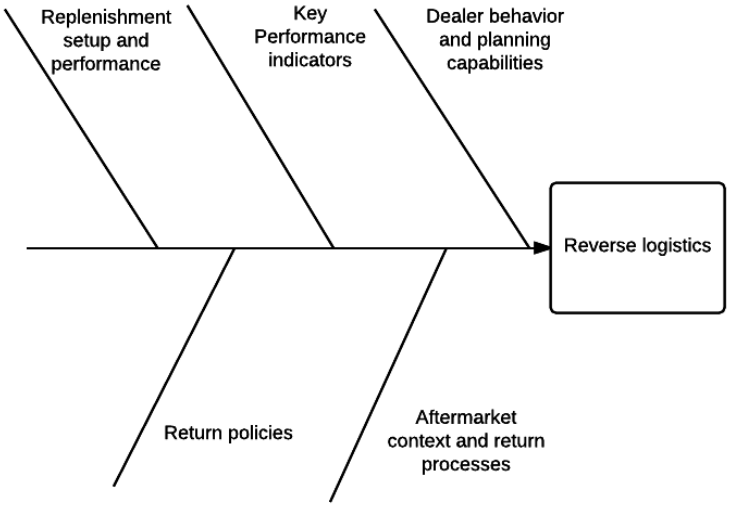

Figure 31. Illustrating the identified drivers of RL

In this section the identified drivers and its underlying mechanisms will be analyzed in order for the thesis to answer research question two. The underlying mechanisms affecting the drivers will be analyzed and visualized through a framework showed in chapter *4.8 Framework for analysis.* In some cases, the mechanisms in isolation do not affect the return flow, however in combination with other mechanisms they create a driver for RL.

5.1.1 Replenishment setup and performance

The current replenishment setup at VTC/VBC affects the amount of parts returned and the underlying mechanisms that make it a driver will be described below and are visualized in figure 32.

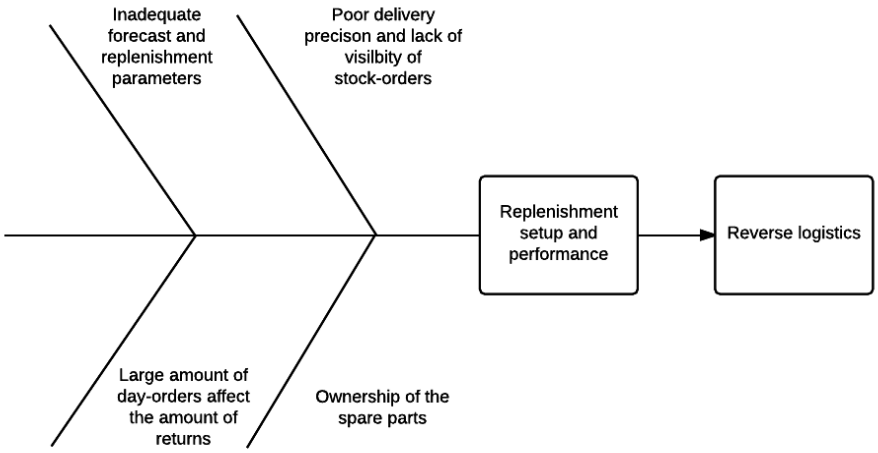

Figure 32. Showing underlying mechanisms making the replenishment setup a driver

5.1.1.1 Inadequate forecast and replenishment parameters

The largest steering mechanism for replenishment is the DIM concept that constitutes for approximately 60 percent of the forward flow in Sweden. VTC/VBC controls the inventory at the dealer, where the MM department is in charge of replenishment and forecasting. The purpose of this concept is to secure availability and even out stock levels at the dealer while making the supply chain operations more efficient. This has proven to decrease the inventory holding cost at the dealerships and generally the stock levels has become healthier for the dealers using this concept. According to Niranjan *et al.* (2012), expertise is required at the supplier, in this case VTC/VBC, in order to manage this kind of setup in an efficient manner. As one of the MM department's core competencies is replenishment, VTC/VBC has the right expertise to utilize a VMI-concept.

Investigating the replenishment parameters, a low-value part only needs one sale in order to be automatically replenished. One consequence is that this can lead to dead stock as the part bought once may not be sold more than once. The logic is that a high turnover rate for the automatically refilled stock should correlate with low number of buybacked lines. However, the opposite was identified, which is illustrated in figure 33.

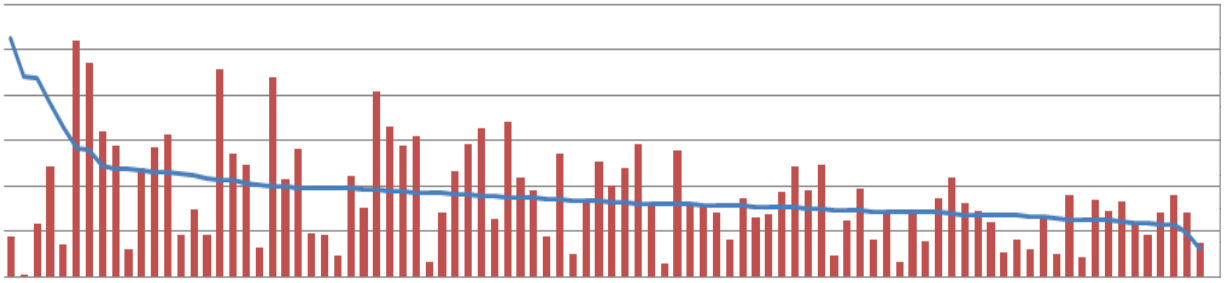

Figure 33. Showing the relationship between TOR for the automatically refilled stock and the # of buybacked lines for all Swedish dealers

The blue line is turnover rate for the automatically refilled stock and red bars illustrate the number of buybacked lines. The trend is that the lower the turnover rate is, the less number of buybacked lines occurs. Hence, the parameters of replenishment could lead to refills of parts that are only sold once and as a consequence the number of buyback lines increases.

Moreover, the parameters set by the MM department makes them deliberately overstocking some parts and therefore take the risk for an increase in buybacks. However, due to the stochastic factors affecting the aftermarket, Wagner *et al.*, (2012) and Cohen *et al.*, (2006) argues that the forecasting is very difficult which influences the replenishment. This is one reason why there is a deliberate overstocking policy from MM. Moreover, according to Stoate and Smith (2005), legislations demand that spare parts needs to be available 12-15 years in the automotive industry. Therefore, the need to consider where the trucks are in the PLC is important to determine what kind of spare parts that are needed, which is further supported by Wagner *et al.* (2012). This aspect has been investigated at VTC/VBC but is not currently influencing the parameters steering the replenishment.

As VTC/VBC is buying back all products that are not sold within one or two years depending on the value, a perfect forecast would result in zero buybacks. The forecast can also increase the number of order-by-mistakes since it affects what the dealers have in inventory. A lack of the right products at the right time will increase the number of day-orders and these parts can then be returned through the order-by-mistake return code. When analyzing the amount of returns in combination with several interviews within the organization, it was shown that the forecast and replenishment parameters could be improved and is highly affecting the amount of returns.

5.1.1.2 Poor delivery precision and lack of visibility of stock orders

Currently, the delivery precision of the stock orders that are automatically refilled is fluctuating. The target for the Swedish market is that the time from order initiation to delivery should be 7 days. However, as the lead time was identified to differ between 6-9 days, a consequence is the dealers do not rely on that the parts will arrive in time, which creates a lack of trust at the dealerships. In addition, the dealers lack visibility in the forward flow since they only know when the order was initiated from the DC, which makes it very difficult for them know when the stock order will arrive. Therefore, they generally order the needed parts for the maintenance through day orders even though the same parts can be included in an incoming stock order. When comparing incoming order lines from stock orders to order lines from day orders, it was identified that up to 20 percent of the day orders for some dealers also were part of an incoming stock orders during the same week. This

percentage increased with the size of the dealer and hence larger dealers tend to order more "duplicates". As it is more economically beneficial to return the manual ordered part since they receive full refund, the dealers can trigger an order-by-mistake return. Even though the dealer initiates the return it is a consequence of the replenishment performance by VTC/VBC.

Moreover, the dealers receive stock orders one to five times per week depending on the size of the dealer. Larger dealers generally receive stock orders more frequently and vice versa. Having more frequent stock orders could imply that it would become easier for the dealer to plan for incoming parts. Hence, a hypothesis is that having a higher control of the incoming automatically refilled goods would make the dealer order less day orders and therefore return fewer parts in the order-by-mistake category, see figure 34.

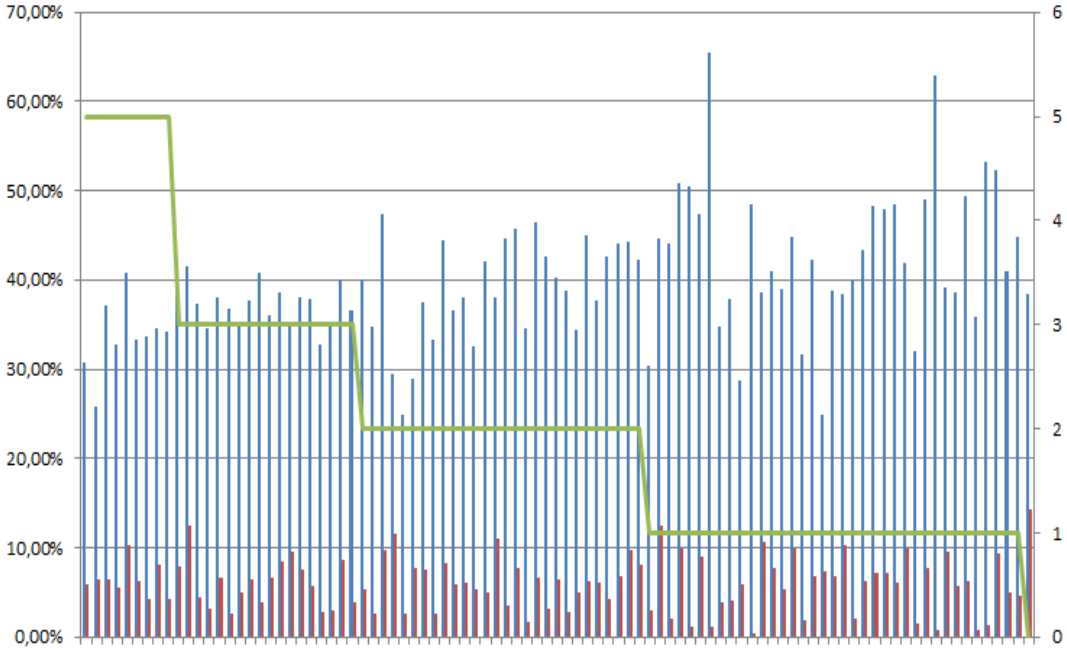

Figure 34. Number of stock orders/week compared to the % of order-by-mistake of the total % returns and % day orders for Swedish dealers.

As shown in figure 34, where the green line is number of stock orders per week, the red bars is the percentage of order-by-mistake as a total percentage of returns vs. sales and the blue bars represent the percentage of day orders. When dividing the graph into sections depending on how many stock orders/week the dealers receive, a trend was identified that the percentage day orders is affected by the stock order frequency. This was most apparent when comparing dealers receiving two stock orders per week with those who receive one. The return rate is moreover slightly increasing if the percentage day orders is increased but this correlation is difficult to identify in the graph since the return flow is affected by so many other factors. However, a deeper analysis showed that when increasing the stock order frequency to two times per week instead of one, the percentage day order decreased with 11 percent. Hence, it is highly possible that increasing the stock order frequency could reduce the order-by-mistake returns as they are a consequence of day-orders, which is further shown in the next section.

5.1.1.3 Large amount of day-orders affect the amount of returns

In addition to the DIM concept the dealers can place orders manually through day or VOR orders. The purpose of these two order types is to increase the availability while making it easier to handle the stochastic factors affecting the aftermarket (Wagner *et al.*, 2012; Cohen *et al.*, 2006). As this is a more responsive setup, the transportation cost is 10 times higher and the handling cost is three times higher compared to stock orders. The large cost driver in this category is that some parts are transported by air due to the urgency which is much more costly than road transportation. The value, complexity and urgency of the products ordered through the day order concept are generally higher compared to the parts automatically refilled through stock orders and this makes them more suitable for a responsive supply chain according to Blackburn *et al.* (2004). However, when this order type is used too much it drives a lot of cost for VTC/VBC and in the end the amount of order-by-mistake returns increase, see figure 35. The red bar is the percentage order-by-mistake of total sales and the blue bar is percentage day orders.

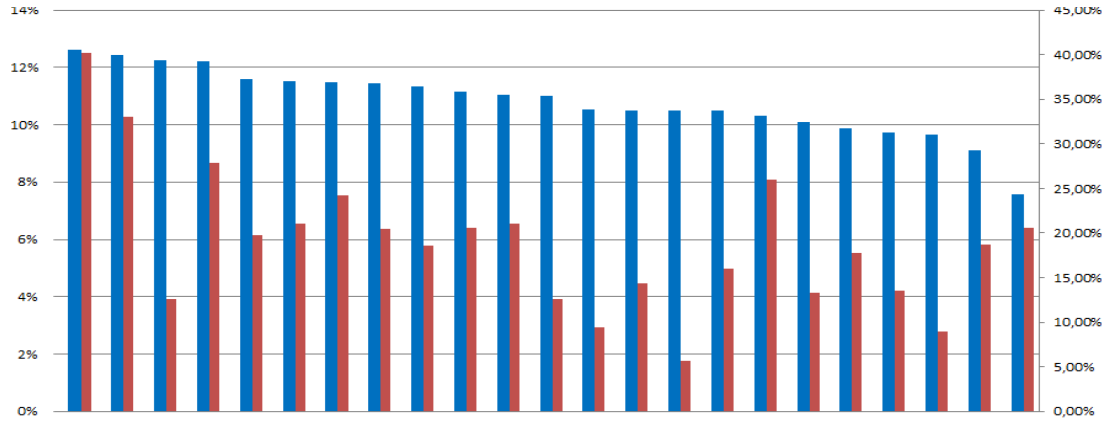

Figure 35. Relationship between % Day/VOR and % order-by-mistake of total sales at the 22 biggest dealers in Sweden

The number of day/VOR-orders affects both order-by-mistake returns and manual buybacks and the largest share of the returns coming from these orders are the order-by-mistake returns. This is mainly due to the compensation factor. If the dealer keeps the manually ordered unsold parts in inventory that then qualifies for buyback, they only get 50 percent refund, whereas they get 100 percent if they return it within the order-by-mistake category. Since it is not regulated how much day-orders a dealer can place, they tend to overuse it, which is further strengthened by the fact that it has increased recent years and it is something VTC/VBC is working actively with to reduce. It is therefore considered rather risk-free and easy for the dealers to place day-orders, which in the end affects the number of returns.

5.1.1.4 Ownership of the spare parts

The ownership of the product changes when it physically changes location between the dealer and VTC/VBC. Through the shift of ownership VTC/VBC can realize the profit of a sold product as soon as it is refilled at the dealer. According to Hart and Moore (1990) the ownership should remain at the supplier when they are supplying several trading partners with similar products. In the case of VTC/VBC the trading partners are the dealerships that are to a large extent buying the same products.

The parts that are automatically refilled are mainly of low value and fast moving such as oil filters, bushings, brake pads etc. The ownership of these products is changing and thus the dealers take the risk of holding the inventory. Hence, dealers prefer to return products in order to minimize the tied up capital and as a result, the ownership of the product is affecting the amount of returns.

5.1.2 Key Performance Indicators

As of today there are no performance indicators for the reverse flow at VTC/VBC and the established KPIs that VTC/VBC is steering their organizations towards is therefore not showing the dealer performance in terms of returns. Mechanisms affecting the drivers are discussed below and visualized in figure 36.

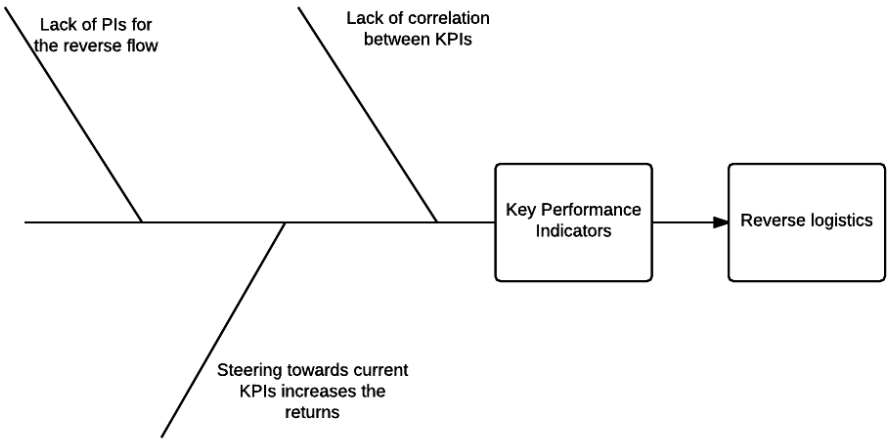

Figure 36. Showing underlying mechanisms making key performance indicators a driver

5.1.2.1 Lack of KPIs for the reverse flow

Niranjan *et al.* (2011) states that companies cannot improve what they do not measure and this reflects the current situation at VTC/VBC. Moreover, Cai *et al.* (2008) discuss the importance of establishing KPIs that are measuring towards the overall business goal, which for VTC/VBC is "to ensure global availability of aftermarket parts to dealers and end customers at the right time, the right place and at the right cost". Therefore, the lack of knowledge for the return flows, mainly due to the lack of a PI, makes it impossible for VTC/VBC to evaluate whether the parts are delivered at the right cost. Moreover, a consequence is that the current measurements do not show any dealer performance in terms of returns, which can create a false picture of the overall dealer performance. As VTC/VBC have periodic communication with dealers to evaluate their performance, the lack of a KPI for returns may instead increase the amount of returns since other KPIs are in focus during these meetings.

5.1.2.2 Steering towards current KPIs increase returns

VTC/VBC are currently steering dealers towards e.g. low percentage of manual stock as they want the dealers to have as much automatically refilled stock as possible. This is due to the LPA-concept and if the dealers keep too much of the manual stock this could affect the replenishment. By only focusing on the automatically refilled stock and optimize that stock it leads to suboptimization, which

could happen when targeting certain KPIs according to Akyuz and Erkan (2009). As a consequence the amount of returns increase since VTC/VBC encourage dealers to return parts that are manually, which has not been evaluated by VTC/VBC before.

VTC/VBC is moreover focusing on the dealers' healthy stock and as VTC/VBC is responsible for the replenishment they want to steer against a high percentage of healthy stock at the dealers. This creates a need for buybacks as all the products considered dead stock needs to be returned to VTC/VBC. However, this is seen as necessary due to that VTC/VBC is responsible to secure healthy stock levels at the dealers due to the DIM-concept, which is further supported by Niranjan *et al.* (2012).

5.1.2.3 Lack of correlation between returns and dealer performance

The correlations between returns and the currently measured KPIs at VTC/VBC are furthermore almost non-existing where no clear trends can be identified to support the purpose of the two return codes in focus. This means that two main issues can be identified in today's situation. One is that some dealers cost VTC/VBC a lot of money by returning large amounts of spare parts without increasing their performance and the other is that their actual performance cannot be evaluated. The availability of spare parts is currently measured through the KPI *Dealer Service Index.* As discussed, the core purpose of the order-by-mistake return is to increase the availability by encouraging dealers to order spare parts without hesitation. As a result, the availability should therefore increase by the number of returns in this return code. However, since the *Dealer Service Index* is a KPI that do not measure the actual availability of spare parts at dealers, it creates a discrepancy between the correlation of the returns and the availability, which in turn hinders VTC/VBC from evaluating the purpose of the returns in correlation with the availability.

A hypothesis that was tested was therefore if the amount of returns can be reflected in the dealer satisfaction when it comes to availability of spare parts. This is illustrated in figure 37.

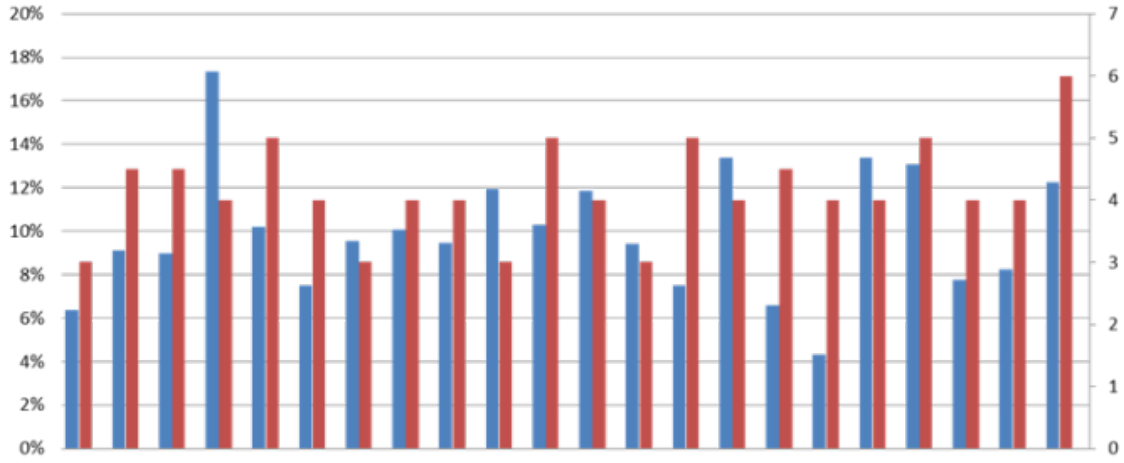

Figure 37. The lack of correlation between returns and dealer satisfaction in terms of availability

The blue bar is illustrating the dealer satisfaction, whereas the red bar is the percentage of returns. The graph shows that no correlation between these two factors can be identified, which points towards that the amount of returns does not affect the dealer satisfaction when it comes to availability.

Moreover, another hypothesis tested was if the turnover rate in combination with percentage manual stock and how much is returned in the order-by-mistake category should give an indication on what kind of behavior the dealers have. Having a high turnover rate in combination with a low percentage manual stock should indicate that the dealer is selling the products that are manually ordered. However, it was shown that the dealers who are showing good results with VTC/VBC's current measures could instead be significant contributors to the large amount of order-by-mistakes returns, illustrated in figure 38.

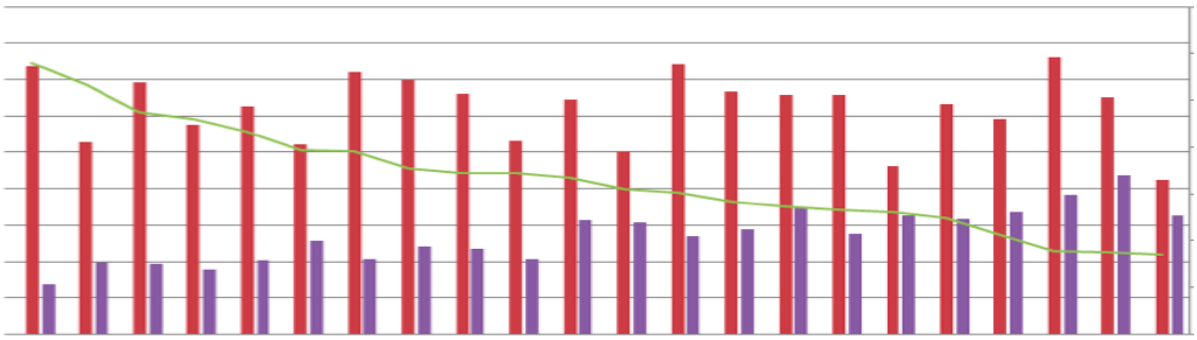

Figure 38. Showing the relation between TOR, "order-by-mistake" and % manual stock at the 22 largest dealers in Sweden.

The green line is the turnover rate for the manual stock, the purple bar is the percentage manual stock and the red is the percentage of order-by-mistake returns as a total of all returns. When analyzing the graph it became obvious that it does not matter if the turnover rate is high when it comes to minimizing the order-by-mistake returns. It was rather shown that the lack of correlation implies that dealers can order large amounts of parts and then return them as order-by-mistake in order to show good results in turnover rate and percentage manual stock.

5.1.3 Generous return policies enabling large amount of returns

As of today, VTC/VBC offers generous return policies to their dealer in order to secure availability. The buyback and the order-by-mistake returns are flows between VTC/VBC and the dealers, hence the returns are happening in a B2B context. Bonev (2012) argues that it is common in the automotive industry to have contractual agreements between the actors that involve options of returning products. However, it was shown by Inmar Reverse Logistics (2009) that generous return policies could lead to increased amount of returns in the aftermarket and this is happening at VTC/VBC. The underlying mechanisms affecting this driver are visualized in figure 39.

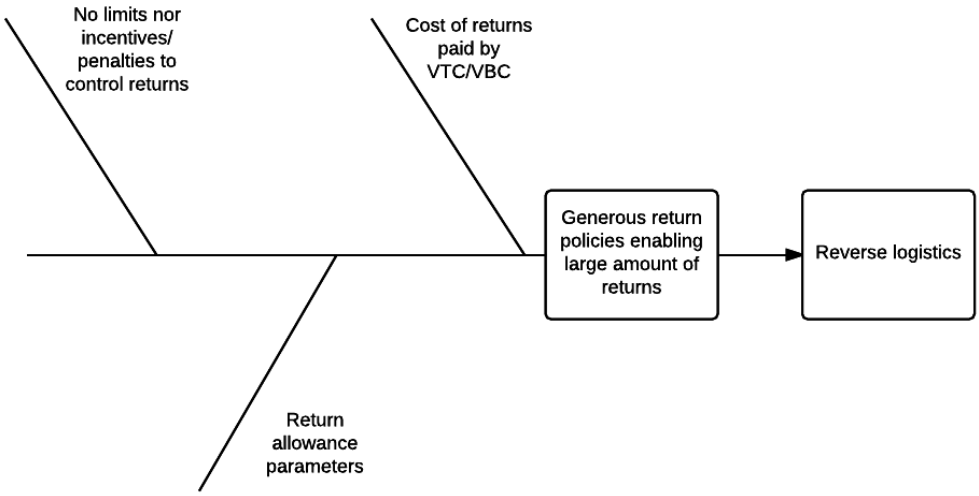

Figure 39. Showing underlying mechanisms making generous return policies a driver

5.1.3.1 Cost of returns paid by VTC/VBC

The current return policies are highly beneficial for the dealers. Currently VTC/VBC is offering a full refund policy for this return category, which is also discussed by Padmanabhan and Png (1995). This could be beneficial in some context, however Gurnani *et al.* (2010) and Su (2009) argues that establishing a partial returns policy could be more beneficial as it is easier to adapt and lead to lower cost for the return policy in the long-term. Moreover, Kulkarni *et al.* (2015) argues that establishing inappropriate return policies could lead to excessive cost and this is the case for this return category at VTC/VBC. Kulkarni *et al.* (2015) argues that the foundation of return policies is to share the risk of e.g. overstocking or taking on too much cost in other areas between the retailers and the supplier. The purpose of the current return policy for order-by-mistake is for the dealer to feel comfortable and not hesitating to order too much in order to secure availability. However, this has enabled an undesired behavior at dealers. The consequence of offering free returns to dealers is that some dealers are able to take advantage of it and can therefore cost VTC/VBC a lot of money. The consequence is that the cost is ending up at the end product, making it more expensive both for the dealers and the end customers. The dealers do not understand this and because of that, the good performing dealers from a return perspective will be affected by the once performing poorly as it affects the supply chain surplus negatively.

5.1.3.2 Return allowance parameters

Looking at the order-by-mistake category, one order-line must have a value above 350 SEK in order for the dealers to return products to VTC/VBC. However, when analyzing what value the returned products have in this category, generally the value of these products is much higher. When comparing to Renault that has a limit of 750 SEK it was seen that the number of returns were somewhat less and the level of customer satisfaction was the same as VTC/VBC. It was also seen that the dealerships are not sending back spare parts to minimize their manual stock at Renault, it was rather a question if there was something wrong with the order. As the cost of an order-by-mistake return line is approximately 30 percent higher than a buyback this drives a lot of cost. This combined with the fact that it constitutes for almost 60 percent of the total returns in Europe it became obvious that this return code is costing VTC/VBC a lot of money.

When looking at the return allowance parameters for buybacks, it was shown that VTC/VBC have no limit for buybacks and as shown previously, the buybacks for VTC/VBC is often smaller products with low value. As the big cost driver in this category is the return handling in the CDC, which is driven by the number of lines, the cost for returning buybacks can exceed the value of the buyback line. Another aspect of the parameters that affects the cost of buybacks heavily is that the dealer has 30 days to send back the buybacks after initiation and after they are sent, the transportation can take several weeks. This is one of the reasons why there is a high fluctuation in the incoming buybacks at CDC. Hence, it makes it more difficult for the CDC to plan their manpower, which often leads to overtime, increased cost and large backlogs of returns. This aspect is also supported in Kulkarni *et al.* (2015), which states that not considering the entire supply chain when establishing return parameters could lead to increased supply chain cost.

5.1.4.2 No limits or incentives/penalties to control returns

Another driver of returns within the return policies is that there are no limits in terms of how much a dealer can return. Darwish and Odah (2010) discuss the importance of having penalties when operating with a VMI-system in order to control flow of parts both in the forward and reverse flow. As described in the empirical findings, dealers can return as much as they want for free as long as it is within the return allowance parameters. This leads to lack of control over the returns from VTC/VBC, where dealers can use returns in ways that are not aligned with the core purpose. Furthermore, this can encourage dealers to order extra parts without hesitation, instead of trying to improve their planning processes, and then return the parts in the order-by-mistake code. The lack of limits also applies for the buyback returns, but this is more a VTC/VBC issue as the dealers cannot affect how much spare parts VTC/VBC are willing to refund the dealer for.

As of today, there are no incentives or penalties established towards dealers when it comes to the reverse flow. VTC/VBC do however apply some bonuses in the forward flow, mainly to reduce the amount of day and VOR orders. The lack of such programs further implies that the dealers have too much freedom in how they use the returns, which mainly applies for the order-by-mistakes. Hence, VTC/VBC is taking on most of the risk when the dealer has this high degree of freedom and according to Kulkarni *et al.* (2015) and Mittal *et al.* (2012) the risk sharing should be equal which is not the case at the moment. As the automatic buybacks are initiated by VTC/VBC and included in the LPA contract, it is more of an internal issue to control this. However, as VTC/VBC do also apply buybacks for manually ordered products for a refund of 50 percent, the lack of control mechanisms for these returns can eventually affect the number of buybacks.

5.1.4 Aftermarket characteristics and deficient return processes

It is difficult to neglect the fact that operating in the aftermarket is complicated due to several reasons and this is of course affecting VTC/VBC as well. These factors drive returns and are difficult for VTC/VBC to do anything about, however understanding them and how they affect the amount of returns is imperative. Moreover, some process improvement could be beneficial to reduce the amount of returns. Hence, the aftermarket characteristics and the current return processes has some underlying mechanisms driving returns, see figure 40.

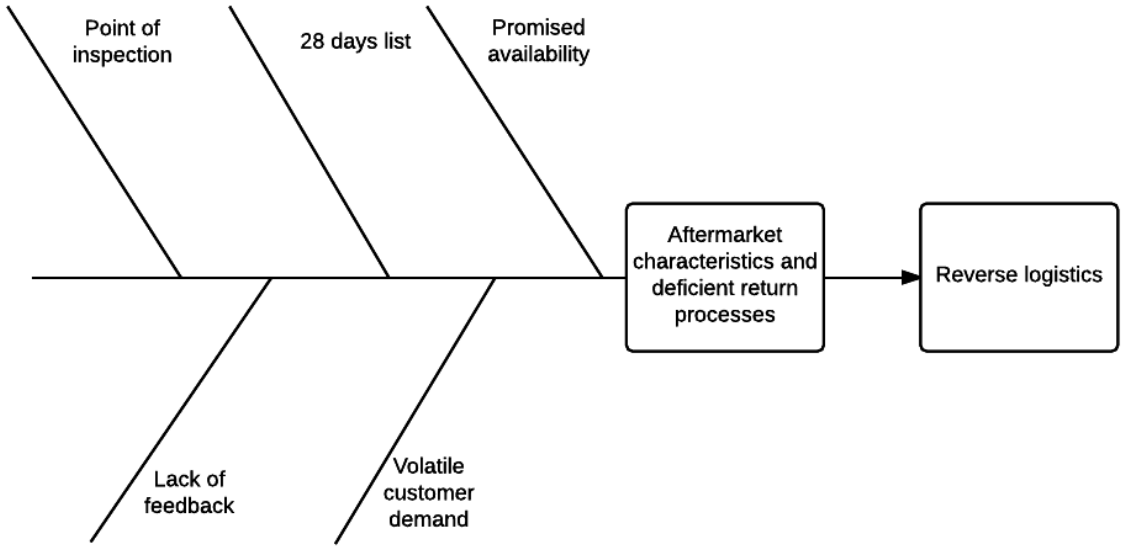

Figure 40. Showing underlying mechanisms making aftermarket characteristics and deficient return process a driver

5.1.4.1 Promised availability

As described by Syntetos *et al.* (2012), Stoate & Smith (2005) and Wagner *et al.* (2012), the aftermarket has gained attention as it stands for a large portion of many companies' profits and is highly influencing the customer satisfaction. As a result, the availability of spare parts has gained focus, which is one of VTC/VBC's key challenges in the aftermarket. The focus on availability is one of the core drivers to returns where mainly the number of order-by-mistakes is affected but also the buybacks. The cost of improving the service level increases exponentially, since it will force the dealer to stock more parts and place orders before the broken truck arrives. The promised availability will therefore affect the dealers' order patterns, which in turn will lead to an increased amount of returns. Furthermore, in Sweden and especially on the truck side, the vehicles are more complex and the up-time for a truck in Sweden is much higher than for a truck in e.g. Poland, which can be one of the reasons why the return rate is higher in Sweden.

As for the order-by-mistake category, the demand for up-time is a large driver for this return category. Makarova *et al.* (2015) states that it is very costly for customers to have trucks idle as every hour is measured as lost profit. Since VTC/VBC is compensating customers for the down-time of trucks, it can be very costly if the needed parts are not available at the right time. Hence, dealers order extra parts to secure that the trucks can be repaired directly since the order-by-mistake return category allows them to return all parts that were not needed. Furthermore, dealers must have healthy stock and free up shelf space in order to store the right parts. Since the dealers cannot store every part that VTC/VBC offer, the buyback return code facilitates the process of having the right parts at the right time. The focus on availability is therefore creating large amounts of returns in the buyback category and if VTC/VBC would try to increase the availability, the buybacks would most likely increase as well.

5.1.4.2 Volatile customer demand

As Wagner *et al.* (2012) describes, the spare part market is characterized by volatile demand and several stochastic factors affecting the demand pattern. This volatility further implies that a return policy must be in place in order for dealers to cope with the challenge. As spare parts are continuously updated due to e.g. new solutions or changes to improve the current features or quality, it creates dead stock that dealers cannot sell. Furthermore, transport companies are continuously updating their vehicle fleets, which extinguishes the demand for certain parts stored at the dealer. These parts are one of the core drivers to the buybacks since the LPA contract involves that the products that are not frequently sold are bought back by VTC/VBC. Moreover, looking at how the volatile demand is driving order-by-mistake returns, it was shown that dealers must be highly responsive to the customer by ordering spare parts on chance before the vehicle is physically diagnosed. The breakdown of a vehicle is furthermore very difficult to predict (Wagner *et al.* 2012). This further creates a volatile customer demand where responsive solutions must be in place to support the customer needs. Therefore, the order-by-mistake returns are increased since the dealer must order a wide range of different products to ensure that the parts are available when the customer arrives with the broken truck.

5.1.4.3 Point of inspection

According to Barker and Zabinsky (2008) there are two different approaches when it comes to inspection of the returned goods, a centralized approach or a decentralized approach. Currently, VTC/VBC have a centralized approach for the inspection of goods, where most of the spare parts are inspected and reused or scrapped at the DC. The inspection procedures are done manually by the employees, which can be seen as a rather low-cost inspection as no equipment is needed to perform the inspection. Barker and Zabinsky (2012) argue that when the inspection and testing procedure is low cost it would become more beneficial for companies to have a decentralized approach where the goods are inspected and scrapped on site. What is also important when looking at the scrap for VTC/VBC is to distinguish between two types of scrap; the LPA-scrap that is decided by the system to be scrapped since it is considered dead stock that constitutes for about 25 percent of the buybacked lines. The other type of scrap is parts that are initially returned through e.g. order-by-mistake or buybacks that do not meet the quality standards. Currently about 1 percent of the returned order-by-mistake and 4,3 percent of the buybacks is not meeting the quality standards at the DC. This could be a consequence of the inspection procedure at the dealer not being as thorough as it is in the DC and therefore the part will not meet the quality standards to be re-saleable. Another aspect is that the dealers send products back that have been mounted on the truck once for testing. These products are not accepted in the DC and will be scrapped. It can therefore be argued that it is both an operational and behavior aspect that affects which parts that are sent back to the DC and then scrapped. Hence, this becomes a driver of returns as many parts that are transported back to the DC are transported just to be scrapped. This creates an unnecessary transportation and handling cost for VTC/VBC as these products could not be reused.

5.1.4.4 Lack of feedback

As previously stated, the reverse flow of spare parts has gained almost no attention at VTC/VBC. There is zero visibility and no system connected to the reverse flow and both Niranjan *et al.* (2011)

and Hall *et al.* (2013) argues that communication and sharing of information is crucial in the reverse flow. The communication between VTC/VBC and the dealers are minimal when it comes to the reverse flow. Therefore, there is a lack of feedback of returned products. When a dealer gets a part rejected due to e.g. quality issues the only information they receive is that they will not receive any refund and no reason why the part has been rejected. The reason why it did not qualify could be e.g. a small scratch on the part and instead of returning these parts, dealers could keep them and use them for repairs since the part itself is fully functioning. Therefore the lack of feedback is a driver of returns since dealers return spare parts that will never qualify for refund. Moreover, the dealers do not receive any feedback regarding how much they return in total and as a consequence they do not understand what impact returns have on cost and the upstream supply chain. Hence, a consequence is that it becomes difficult for the dealer to improve their operation as they do not know what and why to improve.

5.2.4.5 28-days list

Another factor within the return processes, which drives returns, is the 28 days list, where dealers receive an automatically generated list of parts that have been stocked close to 28 days. The parts on the list can then be returned within the order-by-mistake return code. This list is generated in VTC/VBC's system, which means it is actually VTC/VBC that is increasing the returns by encouraging dealers to send back the parts that are within the return limits for order-by-mistake. As VTC/VBC is responsible for all costs included, this can be seen as a paradoxical process from VTC/VBC as it will potentially increase the number of returns from dealers. As described in Bonev (2012), the trend is that returns are increasing and as the strategy is to reduce the amount of returns in order to cut costs in the aftermarket, the encouraging of returns is not aligned with the overall business goals.

5.1.5 Dealer behavior and planning capabilities

The current behavior at the dealerships is mainly a large driver when it comes to the order- by-mistake category as this return category is initiated by them but also for the manual buybacks. Several underlying mechanisms have been identified and they are visualized in figure 41.

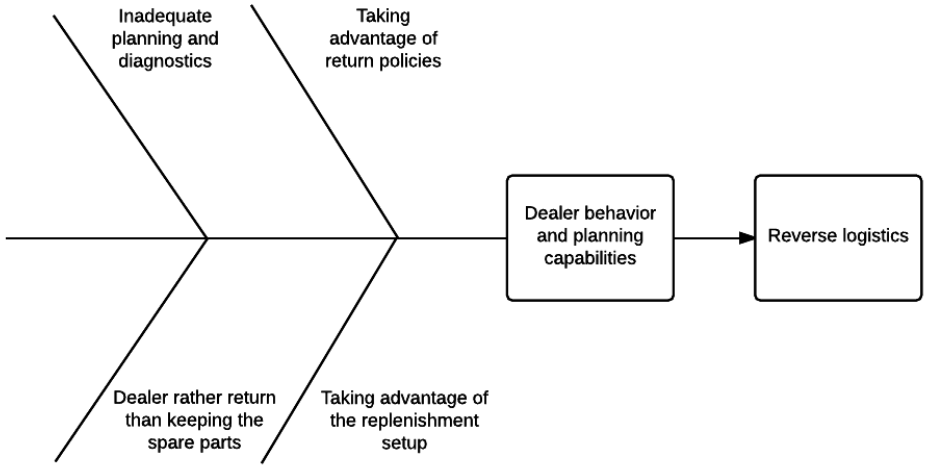

Figure 41. Showing underlying mechanisms making dealer behavior and planning capabilities a driver

5.1.5.1 Taking advantage of replenishment setup

Hall *et al.* (2013) argues that communication is one of the largest challenges for companies working with RL and operating in a supply chain with several actors. Currently the dealers have limited understanding how their ordering behavior affects the total cost of the product, the supply chain issues and the environmental factors associated with day orders. This has caused the dealer to establish an ordering behavior that is very costly and unsustainable for VTC/VBC, which in turn increases the amount of order-by-mistake and manual buybacks.

Moreover, the unlimited amount of day-orders that dealers can place and then, without any consequences, return it creates a behavior at the dealer that in the end costs a lot of money for VTC/VBC. The day and VOR order concept do not force dealers to evaluate and improve their planning capabilities as they do not get incentivized nor receive any penalty if they order a lot within these order types. However, the setup is needed to handle the varying factors that characterize the aftermarket (Cohen *et al.*, 2006; Wagner *et al.*, 2012) but at the moment a large share of the outbound flow is transported through these order types in Sweden. It was seen that the ordering pattern for day-orders was highly fluctuating indicating that dealers are taking advantage of the day-order setup. It was identified that day-orders correlate with order-by-mistake, hence when dealers are misusing this responsive it will lead to a larger amount of returns.

5.1.5.2 Taking advantage of return policies

As VTC/VBC offers very generous return policies without regulations or penalties, some dealers tend to take advantage of the situation. By comparing the 22 biggest dealers, it was identified that the percentage returns is highly fluctuating, which is illustrated in figure 42.

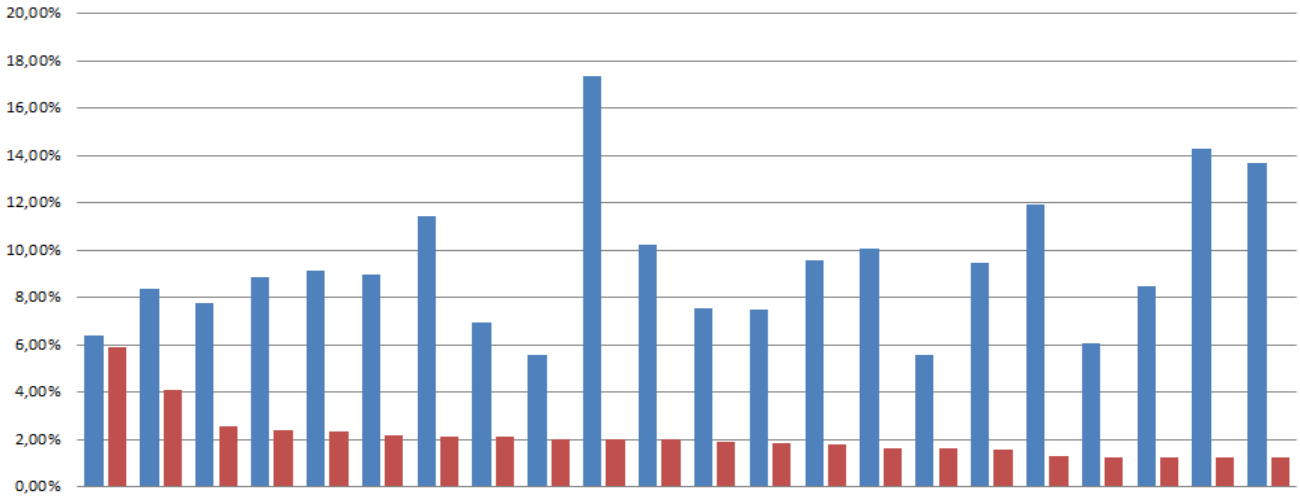

Figure 42. Illustrating the fluctuation return patterns for the 22 biggest dealers in Sweden

The red bar is the percentage of total sales in Sweden, whereas the blue bar is how much the dealer returns. One can see that it is highly fluctuating where some dealers have approximately 5 percent and others have a return rate of almost 20 percent. This indicates that how much a dealer returns is highly dependent on the dealer itself and that some dealers is taking advantage of the current policies as they can return as much as they want. When investigating some of these dealers it became obvious that there is no trend that large amount of returns increases the overall performance. Hence, the fact that some return more than average is because they have the possibility to, not that they need to. Dealers that have a larger percentage of returns may therefore do this because it is in their own best interest. The effect on the overall supply chain is not considered and therefore this creates problems and increased cost for VTC/VBC. Not considering the risk balance in a return policy will create problems such as excessive cost (Kulkarni *et al.*, 2015) and this is what is currently happening between VTC/VBC and their dealers.

5.1.5.3 Inadequate planning and diagnostics

As the current policies and setup encourages dealers to safeguard and order more than needed to handle the stochastic factors of the aftermarket described by Wagner *et al.* (2012) and Cohen *et al.* (2006) this leads to that the dealers establish a certain order behavior. Moreover, they do not need to evaluate or improve their initial planning as they are taking a minimal risk when ordering too much. As a consequence the initial ordering process has become highly qualitative with no physical inspection before parts are ordered, see highlighted area in figure 43.

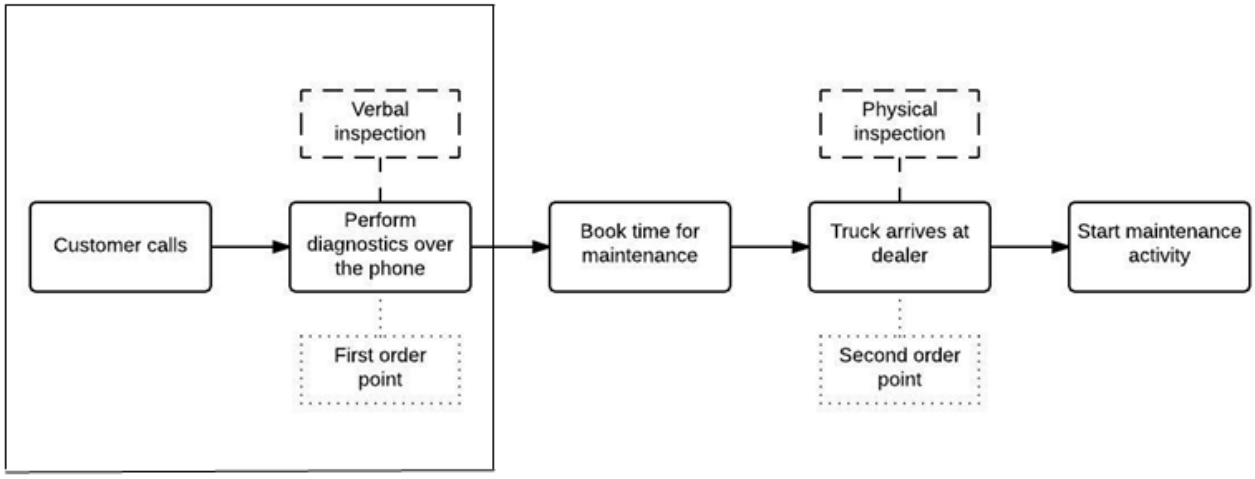

Figure 43. Overview of the ordering process

There is also an indication that when comparing dealers to dealers in Sweden that the experience of the person receiving the call from the customer affects the outcome of what is ordered, which is also supported by Shapiro *et al.* (2004) who states that the level of experience that the customer service representative has, affects the ordering process. What was found at some dealers with a higher percentage of returns was that if the designated customer representative was not able to take the call, it was patched through to e.g. a mechanic that could lack the same diagnostic experience. This could influence how many parts and if it was the right parts that were ordered from the beginning, which influences the amount of parts returned.

However, doing a diagnostic over the phone is very difficult and it is also highly dependent on what kind of information one can extract from the customer. This causes an unintentional distortion of the information as mentioned by Niranjan *et al.* (2011). In this case, dealers order more than needed to secure that some of the ordered parts cover the demand for the customer, since they do not have enough information to order the exact right parts. One can also argue that an intentional distortion of the information as mentioned by Niranjan *et al.* (2011) can happen as the dealer orders several parts to secure that a part of the delivered parts covers the demand. These two scenarios could be caused by inexperience and could create a certain ordering behavior at the dealers that in the end drives a lot of order-by-mistake and manual buyback returns.

5.1.5.4 Dealers rather return than keeping spare parts

The fact that the dealer behavior is a key driver for returns was further strengthened by the interviews conducted with dealers. It was shown that dealers prefer to return parts than keeping them even though they are sure that a manually ordered part will eventually be sold. This is a result from that returns are free and since they can place a new order on the same product and still receive it the day after. Moreover, the KPIs that VTC/VBC are evaluating the dealer performance on described in chapter *4.1.3 Key Performance Indicators at VTC/VBC* further makes the dealer prefer to return the spare parts rather than keeping them. It is therefore argued that the overall system is driving the dealer behavior since there are mainly positive effects from returning large amounts of spare parts for

the dealers. However, for VTC/VBC this is very costly, negative for the environment and causes a lot of disruptions in the supply chain.

5.2 Summarizing framework for analyzed drivers

As there are significant differences between what drives order-by-mistake and buybacks, they have been separated into two frameworks shown below. Since the order-by-mistakes are dealer initiated whereas the buybacks are VTC/VBC initiated, separating between the drivers is important in order to focus the actions.

Order-by-mistake

After analyzing the drivers of this return category it became obvious that there were several drivers affecting why parts are returned within the order-by-mistakes category. When analyzing the different drivers, it became evident that they all eventually affect the dealer behavior, which in turn leads to large volumes in the reverse flow. One example is that if the return policies had not been as generous, the dealer could have been more restrictive in their return behavior. Another example is if the delivery precision of stock orders had been perfect, the number of spare parts arriving with both a stock-order and a day-order would be reduced and therefore also the order-by-mistake returns. This increased the complexity of just attacking one driver to reduce the number of returns as there are several drivers affecting one key driver, see figure 44. This leaves VTC/VBC with two options: Introducing an action towards the underlying mechanisms only affecting the dealer behavior or taking action on all of the other drivers and their underlying mechanisms to change the behavior and reduce the number of returns in the order-by-mistake category. It is however suggested to take action on both options to ensure long-term success and these actions will be further discussed in chapter *5.3 Analysis part 2: Actions towards drivers*

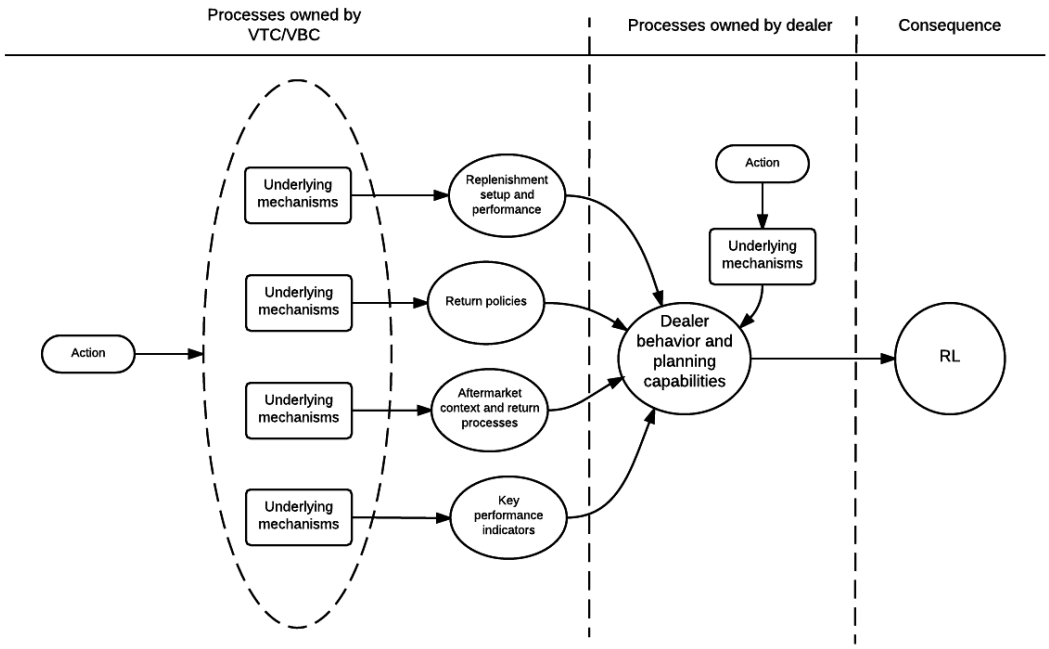

Figure 44. Framework for analyzing the order-by-mistake

Buybacks

In comparison to the order-by-mistake return code, it was identified that it is not the dealer behavior that is the main driver, but all the drivers together that creates a need for VTC/VBC to have the buyback return code. Since there are both automatic and manual buybacks, it is not only a question of VTC/VBC's replenishment setup and performance that drives buybacks, but also the manual orders placed by dealers. The buybacks are bit more complicated to address since the current setup creates a need for it. However, one action could mitigate several underlying mechanisms, which could reduce the number of buybacks. In figure 45 it is shown that all the drivers creates a need for a buyback that in turns drives the RL.

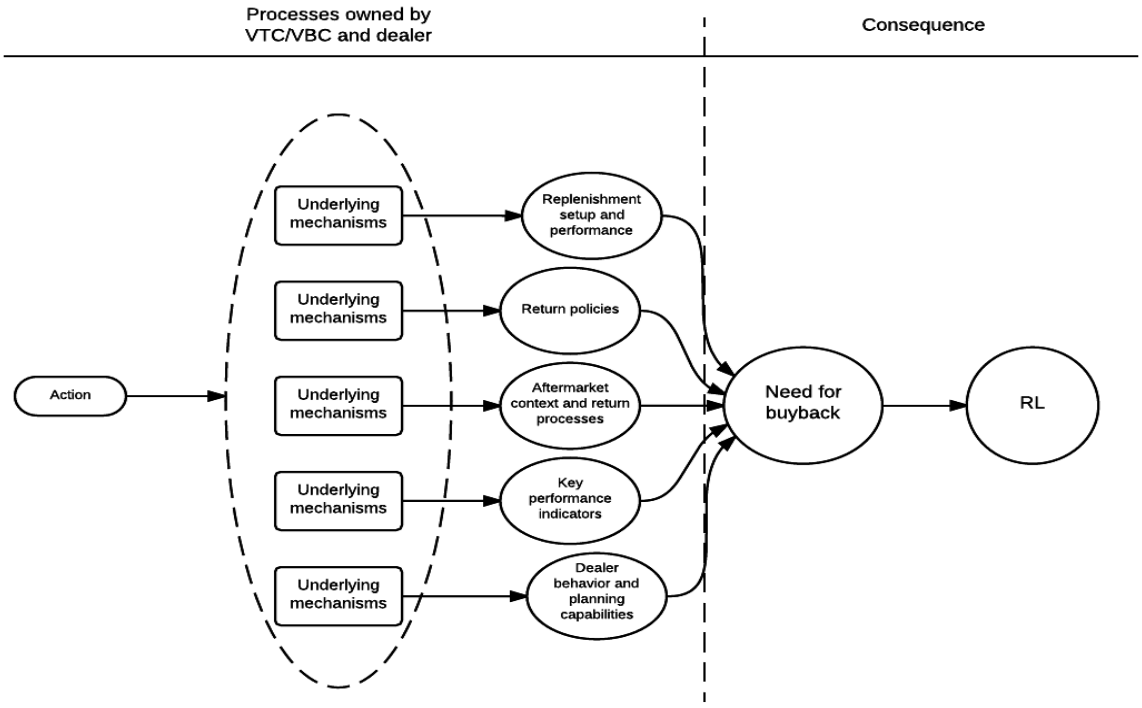

Figure 45. Framework for analyzing the buybacks

5.3 Analysis part 2: Actions towards the drivers

In this section it will be evaluated how the identified drivers and their underlying mechanisms could be mitigated and through this, research question three will be answered. The actions have been categorized in the same way as the drivers where the different actions will apply for either order-by-mistake, buybacks or both. A figure for the actions is then presented in order to summarize the future actions that VTC/VBC needs to evaluate further. Furthermore, an "impact/complexity" matrix was developed in order to examine what actions to prioritize.

5.3.1 Improving the replenishment setup and performance to reduce returns

After analyzing the drivers it was seen that the current replenishment setup and performance has areas of improvement in order to reduce the amount of returns. The identified areas of improvement were to change the parameters for replenishment, increase the frequency and delivery precision of stock-orders and increase the visibility in the forward flow.

5.3.1.1 Change parameters for replenishment

The replenishment parameters was identified as a driver, where e.g. a part can be sold once and only sold that specific occasion during one year. However, as it is automatically replenished with e.g. five new parts, it will create dead stock at dealers and these parts will eventually qualify for a buyback. One suggestion is that VTC/VBC could increase the number of picks for a spare part to qualify for automatic refill. As many of these spare parts are of low value but high quantity, it indicates that the replenishment parameter is set too low. By increasing the number of picks per year there is a possibility that the number of buyback returns could decrease. A consequence would be that the dealers would have to order an additional day-order in the initial phase to reach the higher pick-limit. When comparing the cost of a day order to the cost of returning a buyback it is seen that ordering an additional day-order is 51 percent cheaper. Therefore, it is more financially viable to order an additional day-order compared to receiving a stock-order with many parts that then qualifies for a buyback.

Moreover, the awareness at dealers has to increase when it comes to understanding the consequence of refilling more parts than needed. The current attitude is that it does not matter if VTC/VBC sends out too much as the dealers know that it will eventually qualify for a buyback and they can return the parts free of charge. The communication between VTC/VBC and the dealers have to increase in order to make the dealers understand how the system works and the consequences when dealers sell parts that are not sold before or that has a low sales frequency. This since the dealers have the possibility to manually block parts and avoid them from qualifying for automatic replenishment. Hence, this has to be communicated to the dealer that they have to use this function in order to avoid parts being replenished that are not needed more than once.

5.3.1.2 Increase frequency and delivery precision of stock orders

In addition to the suggested improvements above there are more aspects to consider in the forward flow that affects the amount of returned parts. The delivery precision of stock orders is fluctuating, which makes the dealer not trusting them to arrive on time. The goal is to have seven days of lead-time in Sweden, however the delivery precision was identified to be very inadequate and can differ

from 6-9 days. The consequence is that the dealer may place a day order even though the part is arriving with a stock-order. Therefore it is of high importance for VTC/VBC to examine why the fluctuation occurs in order to improve the delivery precision of stock orders. A suggestion is to start investigating the operations at the DCs as it was indicated during several interviews that the delivery precision at the DCs were highly affecting the overall delivery precision.

Moreover, the hypothesis of increasing the stock order frequency was tested to see if the amount of order-by-mistake decreased. When analyzing the data for Swedish dealers it was seen that if VTC/VBC would increase the frequency for dealers with one stock-order/week to two, day/VOR orders could decrease by 11 percent. Hence, increasing the frequency of stock orders could decrease the amount of parts returned as it is seen that the amount of day/VOR orders correlate with the order-by-mistake returns. However, as it was only done for the Swedish market, one could only see a small trend and the analysis has to expand to other countries in order to verify that this is the case. If the frequency would increase it would mean that each shipment would contain less parts and this has to be evaluated from a transportation cost perspective to make sure it is a viable suggestion. However, this cost has to be compared to the cost of a day order and the cost for an order-by-mistake return. The cost of stock-orders is generally ten times lower than for a day order, which indicates that more frequent stock orders could decrease the total cost.

5.3.1.3 Increasing the visibility in the forward flow

Another aspect is to improve the visibility in the forward flow as dealers currently only see when the stock order is initiated in the CDC and has to calculate by themselves when the order will arrive. If the dealer instead had been able to follow the delivery it would ease the planning and hence minimize the risk of the dealer ordering an additional day-order. This could also facilitate the information sharing, which is imperative to avoid information distortion and to ensure efficient operations according Hall *et al.* (2013) and Niranjan *et al.* (2011). Improving the visibility could be done through improving and integrating the current IT-systems that supports the forward flow and this will obviously come at a cost. From a long term perspective increasing the visibility could decrease the distribution cost, since the number of day orders can be reduced and as a consequence the order-by-mistake returns would most probably also be reduced along with the number of day-orders.

5.3.2 Introducing new KPIs and aligning performance measurements

The foundation of using KPIs is in order to steer the entire organization towards the overall business goal (Akyuz & Erkan, 2009). Looking at the aftermarket and RL at VTC/VBC, the overall goal is to secure availability and to retrieve parts at a low cost. However, VTC/VBC do not know the cost of high availability from a RL perspective and the overall performance of a dealer due to the lack of KPIs within this area.

5.3.2.1 Returns vs. sales

As was identified, the lack of KPIs for returns is a large issue for VTC/VBC today where they cannot measure the dealer performance to its full extent. Hall *et al.* (2013) argues that companies cannot improve what they do not measure and this has to change for VTC/VBC in their return flow. Letting RL slip under the carpet has become costly for VTC/VBC and needs to be addressed by several

measures. One of the fundamental evaluations in which this thesis have focused on to evaluate both countries and dealers in Sweden has been the percentage returns vs. sales and this is further supported by Inmar Reverse Logistics (2009) to be a proper KPI for automotive companies in the aftermarket. The information needed for this KPI is easily accessible within the organization since the credit notes both in the forward flow and in the returns already exist in compiled financial documents.

In order for VTC/VBC to start improving their RL by e.g. reducing the number of returns, it is of utmost importance to introduce this KPI since they cannot see how any actions could reduce the amount of returns without it. Moreover, this new KPI would enable VTC/VBC to improve their internal benchmarking by comparing country-to-country and dealer-to-dealer in order to set target levels depending on the analyzed market. What became evident during the thesis is that VTC/VBC is encouraging dealers to return spare parts since they do not have any measurements on volumes or the cost of the returns. As the current dealer KPIs can easily be improved by taking advantage of the order-by-mistake return code, the percentage of returns vs. sales can prevent certain behavior while providing VTC/VBC with the full picture and the cost to serve dealers. It is also argued that this new KPI would not affect the current dealer performance negatively as it does not affect nor intervene with the current KPIs.

5.3.2.2 Time-to-credit

Furthermore, the interviews with dealers showed that there was a discontent with the time-to-credit for the returns. As of today, this is something VTC/VBC is not working actively with to reduce, nor measuring on. In order to reduce this lead time, VTC/VBC need historical data to compare the current time-to-credit with, and this KPI is not present within the organization today. By measuring and improving the time-to-credit, VTC/VBC could be able to faster reinsert the returned parts into the forward flow, while increasing the dealer satisfactions since they want their credit note as soon as possible after the return is initiated. This is further supported by Hall *et al.* (2013), who argues that KPIs, such as cycle time and delivery precision can be used in the reverse flow. The target levels and how they are measured must however be adapted to fit the overall business goal since the goal might not be to have as short time-to-credit as possible since it might cost more for VTC/VBC. As e.g. the buybacks are less prioritized than the order-by-mistake in the handling process, this KPI would moreover most likely show different values depending on the return code. As a result, measuring on an aggregated level might include some discrepancies when the time-to-credit for only one return code will affect the total measurements. This KPI would further need data that is not accessible today. To be able to measure the actual time to credit, VTC/VBC need to track when the return was shipped from the dealer. This new data could also be used in the returns vs. sales KPI in order to be able to track the returns week per week more accurately instead of an aggregated level, e.g. on a 6 month basis when using financial data.

5.3.2.3 Buyback lines vs. automatically refilled lines

The third KPI that is suggested considers how VTC/VBC can improve their internal processes of refills. The number of buybacks is very much connected to how the automatic refill processes are handled. Hence, measuring the percentage of buyback lines vs. automatically refilled lines could facilitate the work towards reducing buybacks. This KPI would directly show how much of the

automatically refilled stock that is actually sold and how much of it that is eventually bought back from the dealers. There is however manual buybacks included in the buyback proposal, which must be excluded from the measurements since they derive from manually placed orders from the dealers. By introducing this KPI, VTC/VBC could further improve their DIM concept, while reducing the cost of buybacks.

5.3.3 Modify return policies and contractual agreements

As discussed in chapter *5.1.3 Generous return policies enabling large amount of returns*, VTC/VBC are highly generous in their return policies, which allows dealers to take advantage of the situation in order to improve their internal performance. Adjusting the contractual agreements and return policies is seen as a way of leveling out the risk, which is imperative according to Kulkarni *et al.* (2015). The parameters for spare parts to qualify for returns are seen to be very low both when comparing to e.g. Renault Trucks and also when comparing the cost of returns in relation to the value of the parts. One significant consequence is that VTC/VBC allows returns of spare parts that will cost more to handle than the actual value of the product.

5.3.3.1 Changing return allowance parameter for order-by-mistake

For the order-by-mistake, the general rule is that the dealer must return it within 28 days, with an exception for Sweden where the limit is 42 days, after it was delivered and the value must exceed 350 SEK. By reducing the number of days while increasing the value limit of the spare parts, the outcome is most probably that the order-by-mistakes will decrease. As it was seen in the data that many parts in this category cost more to handle for VTC/VBC than the value that can be extracted, it is suggested to increase the limit for order-by-mistakes to 750 SEK. This is supported by the fact that Renault Trucks have the same limit today and it would also reduce the confusion that can appear since many dealers sell both VTC/VBC and Renault Trucks. It is also supported by the general opinion of dealers that raising this limit would not affect the dealer satisfaction negatively. Moreover, the increase in limit would, according to the credited order-by-mistake data, reduce these returns by 30,1 percent, which would reduce the total cost of returns significantly. Furthermore, reducing the days of which the dealers are allowed to return spare parts could further affect how much they return. It is argued that the dealers do not need 28 days to determine if the part is needed or not. It is suggested that VTC/VBC could lower it to around 5 days and it is argued that this would not affect the dealer performance. However, this is not quantifiable as of today but with the introduction of new KPIs, the effects of changing the days allowed to return can be easily acknowledged.

5.3.3.2 Adjust allowed time to return buybacks

Moreover, as discussed in chapter *4.1.4.1.2 The process of buybacks* the limit of 30 days for buybacks can create planning issues in the receiving CDC. As dealers generally know one year in advance when the buyback will be initiated, they should be able to plan for handling the returns when they receive the list of what is included in the buyback. The 30 days is therefore suggested to be reduced to around 7 days to decrease the volatile return pattern in the CDC since VTC/VBC have planned for how much buybacks that should arrive each week. This would facilitate the staffing of the handling department in the CDC since the fluctuations of received buybacks per week will be more evened out. In addition to this, during the visits at the dealer site it was understood that picking and packing a buyback takes generally 5 days. Therefore it is suggested the 7 day limit should be

executed in a way that the buyback is sent from the dealer day 7 and not e.g. day 2 or 4. If the dealers have a fixed date when it will be sent back, it could become much easier for VTC/VBC to plan for buybacks and hence avoiding the issues at the CDC.

5.3.3.3 Formalize incentives and penalties

To further adjust the policies and contractual agreements, introducing incentives and penalties for the return flow is suggested. The measurement of returns vs. sales is an effective tool to be able to penalize or incentivize dealers that do or do not perform according to expectations. VTC/VBC could set targets in line with benchmark dealers who are currently performing well in terms of both returns and the rest of the KPIs.

Furthermore, there are no limits of how much a dealer can return in the order-by-mistake category. By comparing the value returned in this category to how much the dealers are buying from VTC/VBC, an upper annual limit could be formalized. Gurnani *et al.* (2010) and Su (2009) argues that a partial return policy that is based on the percentage of sales is beneficial. However as VTC/VBC is not affected by a high value depreciation on their parts, it could be more suitable to establish an upper limit that is based on percentage of ordered quantity. As the current situation in Sweden is that 6,5 percentage of the sold quantity is returned in order-by-mistake VTC/VBC could introduce an upper limit of around this could be set as a max limit allowed to return. This would reduce the percentage of order-by-mistake with 13,5 percent. Moreover, if a dealer reaches this limit, VTC/VBC could choose to not compensate the dealers if they want to return more parts. This could make the dealer more cautious what they order (Darwish and Odah, 2010) and could be a solution to address the dealers that are overusing the return code or not using it according to its core purpose, which is to improve the availability. Moreover, a limit of 3 percent could be used for a bonus limit. If the dealer returns less than 3 percent of their total sales in order-by-mistake they could receive a bonus and historically it has been proven that bonus systems is a powerful tool for VTC/VBC.

5.3.4 Adjusting VTC/VBC operations

Currently VTC/VBC has several activities that affect the RL negatively. As the scope of the thesis is to reduce the amount of returns and not make the RL processes more efficient, the suggestion is to adapt or remove certain activities in order to reduce the amount of returns.

5.3.4.1 Scrap-on-site at dealers

The data analysis showed that there are large amounts of scrap and low value products being returned from dealers to VTC/VBC. As discussed in chapter *4.1.4.1.2 The process of buybacks*, VTC/VBC are also buying back all products that are not sold within two years no matter what value it has. As the costs of returning often exceed the cost of producing a new part, scrap-on-site is suggested to reduce the total cost of returns. It was seen that 11 percent of the returned buyback line that were intended to reuse had lower value per line than the cost to return them. Hence, scrapping them on site would be much more economically beneficial for VTC/VBC than to return and reuse them.

Scrap on site means that instead of bringing the spare parts back to the DC, the dealers should have contracts with recycling companies that can pick up and handle the parts that are not wanted. As for

the buybacks, 25 percent of the buybacked order lines are already determined to be scrap and they constitute for about 2,5 percent of the total value and weight returned. Instead of transporting these spare parts to the CDC and then throw them away, it is suggested that this process is decentralized (Barker and Zabinsky, 2008) and handled by the dealer. However, there is a risk that the spare parts may end up on an alternative market (Wagner *et al.* 2012; Bonev, 2012), but through the contracts with recycling companies, this risk can be mitigated. By scrapping these on site at the dealers, VTC/VBC would decrease the total cost of returns and reduce the high variations of incoming goods at the CDC as these parts still need some degree of attention.

5.3.4.2 Remove 28-days list

The 28-days list contains all the manually ordered parts that could be sent back within the order-by-mistake category and that still qualifies for 100 percent refund. At some dealerships they do not keep track of what they have ordered manually or not and they solely rely on the 28-days list that is retrieved once a week. Through this list, VTC/VBC encourages the dealer to return parts that are manually ordered. However, as a consequence of reducing the number of days that is allowed to send back, suggested in chapter *5.3.3.1 Changing return allowance parameters for order-by-mistake* this list will become obsolete. The list could be changed and be sent on a daily basis to support the suggestion of reducing the number of days allowed to send back but this is deemed unnecessary, complex and only a factor that would increase the returns.

5.3.4.3 Investigating the pros and cons of a dealer-to-dealer concept

The basis of this concept is that the dealers should share parts among each other by grouping some dealers that will act as virtual stocking points. If the dealer orders a part from another dealer where the part is not needed, it could decrease both the amount of day orders and the amount of returns in total. The current GDS-system implemented at most of the dealers in Sweden allow dealers to track the stock levels of other dealers. However, as the dealer owns the part, it can cause issues with the financial transactions (Hart and Moore, 1990). For example, dealers could have a negative attitude towards sharing parts with a competitor since it can increase the competitors' sales.

Looking at the larger dealer groups, e.g. Finnveden Group they already use this concept to a certain extent. This is in order to secure a high availability at all their dealers, which creates a higher end-customers satisfaction. In this context, the ownership will not become an issue as the part is sold within the Finnveden Group and the performance and the financial data is measured on a group level instead of on each individual dealer. The problem of ownership usually arises when it comes to smaller independent dealers that do not have any cooperation partner. Therefore, for this concept to work on a nationwide basis, VTC/VBC may have to consider some of the fundamental aspects of their inventory management setup. However, when investigating the current situation of returns, there is a huge upside of implementing this kind of concept since the cost of handling and transportation as well as the indirect costs for VTC/VBC could decrease in their reverse flow.

5.3.4.4 Increase visibility of returns

As shown in the empirical findings, both VTC/VBC and the dealers have currently no visibility in the reverse flow. The lack of IT integration is evident, which cause both dealer dissatisfaction and lack of

control. Through better integration between VTC/VBC's IT-systems, dealers would be able to track the process of their returns and also receive feedback for the rejected returns, which is imperative according to Hall *et al.* (2013). As of today, dealers are complaining about the lack of feedback for rejected returns, which has become costly both for the dealer and for VTC/VBC since they pay for the unnecessary transport and return handling. Moreover, an integrated IT system with the transporting companies would allow both VTC/VBC and dealers to track where the parcels are. This would enable VTC/VBC to improve their planning for returns handling by constantly knowing how much that will be received each day. According to Inmar Reverse Logistics (2009) companies operating in the automotive aftermarket that has a high degree of visibility in their reverse flow is much more successful and profitable than the ones that lack visibility. This was also found in an internal benchmark report that VTC/VBC uses where VTC/VBC is compared to their competitors in different aspects, which strengthen the argumentation that visibility is important in the reverse flow. Therefore, it is argued that this suggestion is valid and would most probably improve the processes of RL at VTC/VBC.

5.3.5 Changing dealer behavior and operations to decrease the amount of returns

After analyzing the drivers it was identified that the VTC/VBC owned processes enables an undesired behavior at the dealers. By taking actions directly towards the dealers, VTC/VBC can expect reductions in mainly the order-by-mistake category but also the buybacks. The communication with dealers is deemed to be the most important aspect to change their behavior. However in order to reach positive results, VTC/VBC needs to show that they are working together with the dealers to reduce the amount of returns and start to improve their own internal processes. Moreover, in order to communicate a clear message, it is also important to establish the right measurements towards the dealer to be able to show how the dealer is actually performing.

5.3.5.1 Increase collaboration and communication

When it comes to the behavior, it has both been shown in the quantitative data analysis and the qualitative that the dealer takes advantage of both the current replenishment setup and the return policies. As all costs for returns are currently covered by VTC/VBC, the dealer has no interest in changing their behavior as they are not affected by the negative consequences. However, what is not communicated clearly to the dealer is that the increased cost that is a consequence of their behavior will affect both them and the end-customer as the price of the spare parts will increase. The lack of supply chain perspective is apparent, which is one of the reasons for this behavior. However, one has to consider the stochastic factors affecting the aftermarket discussed by Wagner *et al.* (2012) and Cohen *et al.* (2006), which force VTC/VBC to offer order-by-mistake and buybacks to some extent. However, in the current situation some dealers are taking advantage of the setup and to some extent misuse it. To strengthen the argumentation one can look at figure 23 where some dealers return almost 20 percent of their incoming goods, whereas others return only three to five percent.

Therefore, VTC/VBC needs to increase their communication with the dealerships and make them understand the consequences of their behavior. By arranging workshops at the dealers to show their performance and discuss how to improve together they will increase their communication and possibly reduce the amount of returns. The return situation is however not solely dependent on the

dealer. VTC/VBC also needs to improve and to do that in the most efficient way, they need to work together. By focusing on a close collaboration with more frequent communication, it is argued that the returns can be significantly reduced both in the short and long-term. However, in order to communicate a clear message, it cannot be stressed enough how important it is to include return KPIs in the dealer performance measurements.

5.3.5.2 Improve and harmonize quality inspections

Another aspect that has room for improvement is the quality inspections done at the dealerships. As described, currently 4,3 percent of the buyback and 0,9 percent of the order-by-mistake returns are rejected due to quality issues. The dealer is not refunded for these parts and they do not receive any feedback from VTC/VBC why the part got rejected. Sometimes the dealers do not have the same thorough inspection procedure as in the DC, which causes it to be a discrepancy between what they believe to be re-saleable condition and what is not. One reason for parts being returned in non re-saleable condition is that the dealers deliberately return parts that have e.g. been mounted once and they therefore take the risk of not being compensated. Another is that the quality inspection at the dealer differs to the one done in the DC. This could be mitigated through harmonizing the quality inspections at the DCs with the ones performed at the dealer, increase communication and making them understand how much money they lose by returning parts in poor condition.

VTC/VBC could also introduce a penalty for dealers that are sending back parts where it is obvious that the quality defect was caused by the dealer. The penalty could for example be that the dealers have to cover the cost of transportation and handling. By introducing a penalty for this kind of behavior, it is likely that the dealer will more thoroughly inspect the parts before they send them back. VTC/VBC could also make their inspection procedure more explicit in order for the dealer to understand what kind of demands there are on quality. By improving this, VTC/VBC would reduce the cost of handling and transporting unnecessary parts and the dealer would not return parts that could be used for repairs instead of being scrapped with no refund. Therefore, this suggestion could both reduce the order-by-mistakes and buybacks.

5.3.5.3 Improve dealer diagnostics procedure and pre-planning

The current diagnostic procedure is highly qualitative and depends on the experience of the employee taking the call and receiving the information from the customer. If the customer cannot provide sufficient information about the vehicle or if the customer service representative is not able to interpret it right, there is a risk that the wrong parts will be ordered or that the dealer safeguards and orders several parts. This will lead to more day-orders and also increase the amount of order-by-mistake returns. There are different ways to attack this, where one could be that the first ordering point is moved to the physical inspection. Instead of ordering the parts after the initial phone call, the dealer could ask the customer to come in for a physical inspection to ensure that the issue at hand will be fixed, see figure 46. This will also secure that the dealer is ordering the right set of parts.

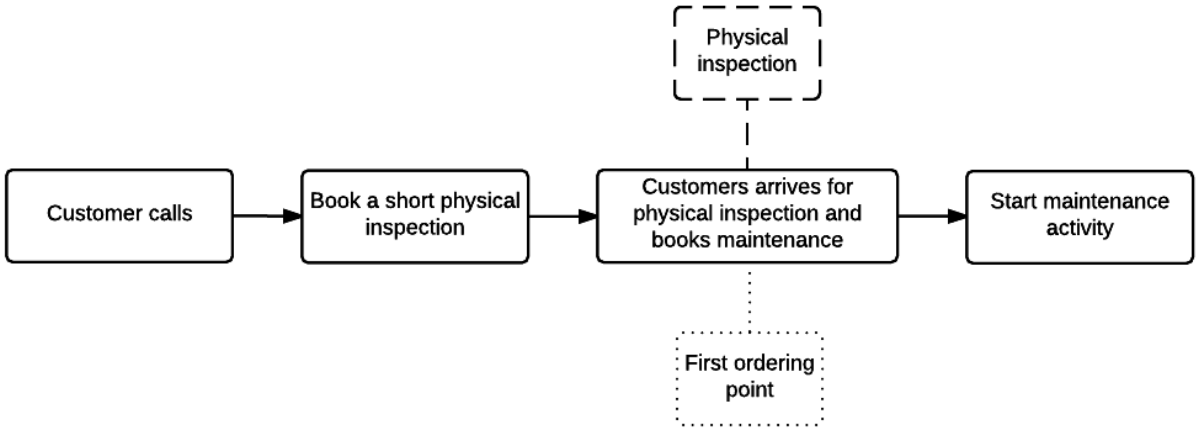

Figure 46. Suggested process of diagnosing

The downside with this procedure is that it will require more time from customer as they need to travel to the dealership twice instead of once. As uptime is of high importance this could be seen as an obstacle. However, a suggestion is to categorize the customers and their trucks at the dealerships in order to understand which customers that have the possibility to enter the dealerships twice. An example could be to group trucks that only drive short-haul transportation during the day and has the possibility to enter the dealerships in the evening. This is further strengthened by the fact that most dealers have long opening hours. It is suggested that VTC/VBC could investigate the possibility at the dealers that are owned by VTC/VBC and initiate a pilot project. A suggestion is to start in a bigger city, e.g. Stockholm where there is a lot of trucks used for short-hauling. By having this physical inspection as the first step before ordering, it could decrease the amount of returns as the inspection of the truck will become less qualitative and less sensitive to information distortion. Hence, the dealer would most probably order the right things manually from the beginning and have no need for returning them in the order-by-mistake category. This will also decrease the risk of parts eventually qualifying for a manual buyback.

Moreover, the use of connected vehicles could improve the pre-planning, which could reduce the amount of returns. Several dealers already have the equipment needed to remotely diagnose the truck with the use of a computer. However, this is barely used due to that it requires manpower and competence. This needs to be developed between VTC/VBC and the dealerships how they can help each other to increase the use of this existing technology. One idea is for VTC/VBC to introduce an incentive for dealerships that can prove that they extended their use of it. Through that, the amount of returns can be decreased due that the diagnostics of the truck will depend on the data from the truck, not the person receiving call or the customer calling in. Hence, there is a possibility that the accuracy of ordering the right parts manually will increase and through this the need for returning parts in the order-by-mistake category would decrease.

5.3.6 Summarizing actions

In order to visualize the actions suggested and make it easier for the reader to understand which driver will be targeted by which action, the actions are illustrated in this section. Figure 47 and 48 is distinguishing between the order-by-mistake returns and buybacks in order to in a clear way display which actions that is needed to reduce the two return codes. The actions towards reducing the amount of order-by-mistake are illustrated in figure 47.

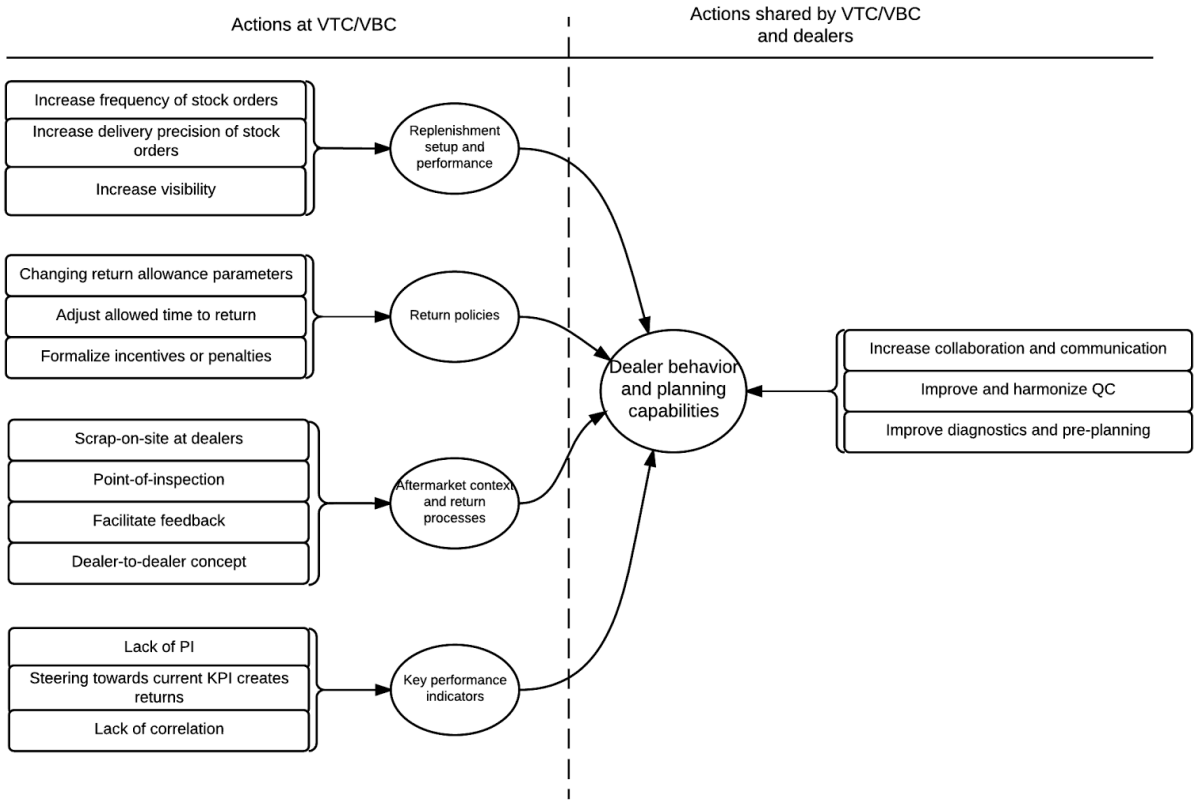

Figure 47. Illustrating actions towards the drivers for order-by-mistake

It was seen that the there are more actions towards reducing the amount of order-by-mistake. The reason for this is that the process of order-by-mistake is highly manual and initiated by the dealer. Moreover, the undesired dealer behavior has been created by VTC/VBC and therefore it is seen to be of high importance to counteract this behavior with the suggested actions. Moreover, the actions towards reducing the amount of buybacks is visualized in figure 48.

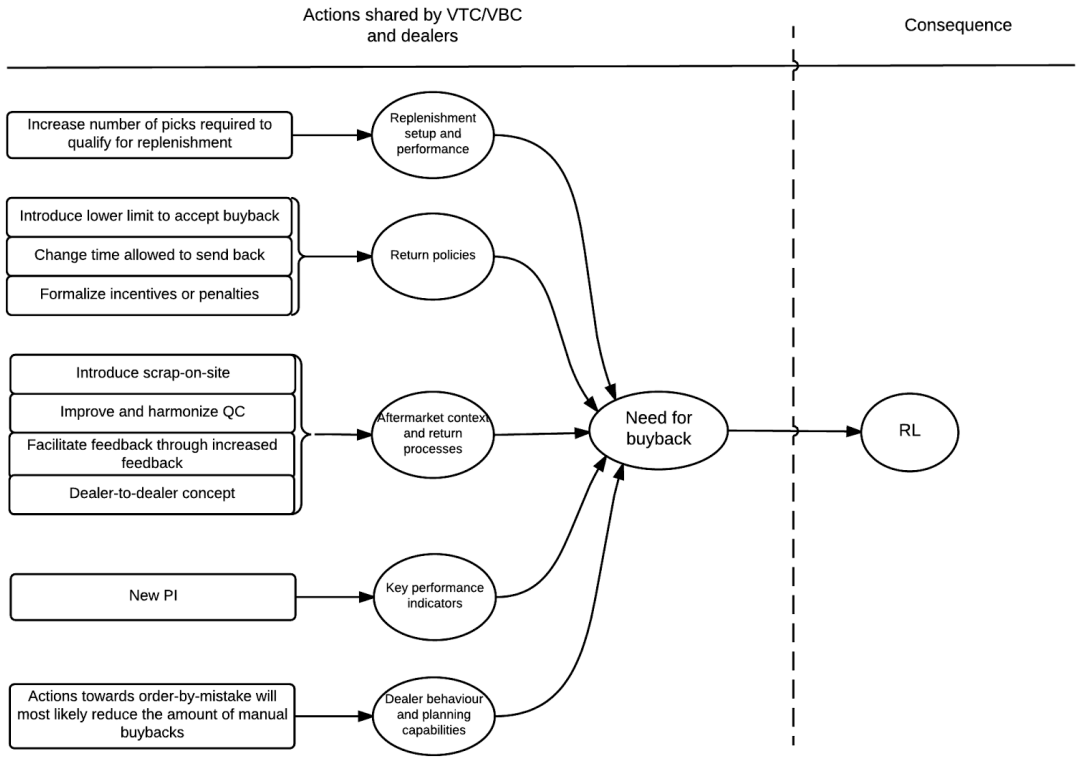

Figure 48. Illustrating actions towards the drivers for buybacks

The actions needed to reduce the amount of buybacks are highly influenced by the operations at VTC/VBC. It is also highly plausible that the actions directed towards order-by-mistake will reduce the amount of manual buybacks that is influenced by the dealer behavior and this will reduce the total amount of buyback returns. Moreover, in order to prioritize the right actions, all these actions were discussed during the second workshop and compiled in an impact and complexity matrix.

5.3.7 Impact and complexity of the suggested actions

This section will provide the outcome of the second workshop and act as guidance to which actions that should be prioritized by VTC/VBC. As this matrix was developed with the upper management at LS, the actions proposed from this matrix are seen as highly feasible. The matrix is visualized in figure 49 below with rankings from 1-10. The x-axis is the complexity of the suggested actions, i.e. how difficult they are to implement. This axis has been rotated, meaning that high (10) is to the left and low (1) is to the right. On the y-axis the impact is ranked, i.e. how much effect these actions can have on reducing the amount of returns.

Figure 49. Complex/Impact matrix of the suggested actions

The matrix is divided into four areas where the top right is seen to be the actions that should receive extra focus as the complexity of implementing these is low and the impact on reducing the amount returns is high. It is suggested that VTC/VBC starts by improving the internal processes and operations in order to get a better response from the dealers when starting to make changes that are affecting them. One suggestion that did not end up in the top-right quadrant due to the high complexity is to increase the delivery precision. This was however discussed to be a key action that VTC/VBC needs to improve in order to reduce the amount of returns. Hence, the first phase of actions that should be addressed is to improve the delivery precisions, increase the frequency of stock orders and implement the returns vs. sales KPI.

The second phase of actions that should be implemented is to change the return allowance parameters, time allowed to return, introduce limits and a bonus program for dealers and most importantly start to communicate and collaborate with the dealers. By establishing a KPI in the first phase, it will facilitate the communication by showing the return patterns to the dealers and their performance in this area. When this is done it is seen to be appropriate to change the policies and introduce limits in order for VTC/VBC to effectively reduce the amount of returns.

In the third phase, VTC/VBC and dealers should together start to investigate how to implement scrap-on-site, how they together can improve the visibility of returns and introduce the D2D-concept. Implementing scrap-on-site is seen to be highly feasible but will require contractual agreements and cooperation with recycling companies. Increasing visibility is seen to be costly and complex and this is therefore seen to be a long-term suggestion to implement. However, if implemented in a proper

way, the amount of returns will most likely decrease and it will also increase the dealer satisfaction as it will lead to better control and feedback. The D2D-concept is also seen as costly and highly complex to introduce. However, as some larger dealer groups are already doing it, VTC/VBC and those dealers could work together in order to implement it on a national level. This would have a rather high impact on the number of returns and from a long-term perspective improve VTC/VBCs performance in the aftermarket. Moreover, the process of developing the suggested actions and increasing the organizational awareness is further described in the next chapter.

5.4 Analysis part 3: Initial phase of implementing actions

This chapter will describe the initial process of implementing the suggested actions. The chapter will use the two workshops as a foundation and it will be divided into three sections: Before the first workshop, between the workshops and after the second workshop. The purpose is to introduce the reader how the authors perceived the change management aspect and how the process was of implementing changes into a large organization as VTC/VBC. This also provides additional value and trustworthiness to the thesis as it explains how the drivers, consequences and actions were validated during these workshops.

5.4.1 Before the first workshop

What was apparent early in this project was that the general awareness of RL within VTC/VBC was almost non-existing. When the authors started addressing the issue, the general opinion at VTC/VBC was that RL exists but it is nothing that requires too much attention since it is necessary to secure availability of spare parts towards the end-customer. The different departments had a tendency to protect themselves and sometimes the interviewees blamed each other that returns exist. When parts of the collected quantitative data could be visualized through the mapping and additional graphs, the attitude changed and all the interviewees started to realize the need for change as the situation was worse than expected. This made employees at VTC/VBC understand the need for change and their survival anxiety grew larger than their learning anxiety (Schein, 1996), which made the authors believe that VTC/VBC entered the unfreeze phase. This also created a sense of urgency discussed by Kotter (2007), which made employees more willing to change. When this happened, the input towards action and what to do in order to improve increased and the authors received a lot of suggestions for improvements. Therefore, the need for a workshop grew in order to spread the sense of urgency to the upper management at VTC/VBC.

5.4.2 Between the workshops

In the first workshop, employees from the upper management within LS attended to give their view and opinions on the current situation in terms of volumes cost, and how returns are affecting the supply chain. The consequences, especially the cost aspect, were raised and the participants understood quite quickly the magnitude of the current reverse flows. This created an awareness and a sense of urgency to change the situation (Kotter, 2007) as the upper management understood that this cost will eventually end up on the price for the spare parts. The presentation used during the workshops was after the workshop requested by several of the participants to show for other parts of the organization and to dealers. Moreover, the area of RL was raised during upper management meetings as a consequence of this workshop. This was deemed as successful by the authors as the

sense of urgency spread throughout the organization. Employees that were not present during the workshop also contacted the authors for additional or clarifying information in order to understand the current situation of returns. As the first workshop was only informative, a second workshop was needed as the drivers and actions were not in focus and needed further validation in order to make a difference at VTC/VBC.

5.4.3 After the second workshop

During the second workshop, the focus was on drivers and their underlying mechanisms and actions that could mitigate these. Some actions and underlying mechanisms were changed, removed and afterwards prioritized from the perspective of impact and complexity. However, most of the underlying mechanisms and suggested actions remained and the feasibility of the actions was confirmed. The mindset of the participants changed towards how to improve the situation instead of just understanding the situation and that it has negative consequences for VTC/VBC. The discussion of whom should be responsible for each action took place but it was not thoroughly discussed due to the limited time of the workshop. However, this is the next step in successful change according to Kotter (2007) to form a coalition responsible for the change. It was also discussed to incorporate the return perspective in a cost-to-serve model for each dealer in Sweden in order to make it apparent for VTC/VBC what dealers that need extra attention.

It is suggested that the next step for VTC/VBC is to form a team or a coalition as stated by Kotter (2007) in order to more actively work with changing the current situation of large return flows. This will help VTC/VBC to implement the suggested actions and secure that the change is handled correctly. VTC/VBC also needs to work with communicating the reason why a change is needed to the concerned departments and this is imperative according to Schein (1996) when implementing a change. Moreover, it is suggested that VTC/VBC sets short and long-term goals and when these goals are set, it is important to acknowledge the short term wins according to Kotter (2007). The foundation for implementing a change has already begun, the important thing is for VTC/VBC to keep the momentum going in order secure that the change is sustainable and the right actions are implemented.

6 DISCUSSION

This chapter will focus on discussing the result of the thesis and how it can add value to Volvo Group. Moreover, the validity and generalizability of the drivers and action will also be discussed. In the end of the chapter, future recommendations for VTC/VBC will be presented.

6.1 Contributions of the results

In this section, the potential outcome of the actions will be discussed from three main areas of improvements which is better understanding and control of the reverse flow, decreased amount of returns and day-orders and reducing the cost and environmental impact for VTC/VBC in their reverse flow. However, focusing on all actions at the same time may not be most suitable way to implement change and the impact/complexity matrix was therefore helpful in order to prioritize among the actions. Hence, the actions with high priority will only be discussed in this chapter.

6.1.1 Increased understanding and control of the reverse flow

By mapping the current situation in terms of volumes and costs and showing the drivers and their underlying mechanisms in the frameworks illustrated in figure 44 and 45, VTC/VBC gained a better understanding of their reverse flow. This is imperative in order to control the reverse flow and to evaluate if changes are successful or not.

The first and most important control mechanism is to establish a new KPI for the reverse flow that is analyzed in chapter *5.3.2 Introducing new KPIs and aligning performance measurements*. As the area of RL had gained almost no attention prior to the thesis it was not surprising that a KPI was absent for this area. In order for VTC/VBC to control, and in the future improve the RL, of spare parts it is imperative to establish new measurements. When not measuring VTC/VBC will continue to have a limited knowledge of their reverse flows and the situation could become even worse. By establishing new KPIs, VTC/VBC can track progress of reducing the amount of returns through the suggested actions and most important they can track the real performance of a dealer. Up until now, the KPIs evaluating the performance of a dealer is inadequate, hence misleading information is given to both VTC/VBC and dealers about the actual situation and how dealers perform. However, the goal with the new KPIs for returns needs further attention in order to not counteract other more important dealer performance indicators before implementation.

The second action that will improve the understanding and control of the reverse flow is to more actively discuss the dealer performance with the dealers. Currently the dealers and VTC/VBC have a different view on why returns occur and often they blame it on each other. To increase the overall supply chain performance, they need to increase the communication and collaboration by giving each other feedback and discuss how to work together towards changing the current situation. However, this will require a lot of effort both from VTC/VBC and the dealer. The most important issue is to find personnel responsible for communicating and collaborating with the dealer. However, this is already done to a certain extent already, therefore VTC/VBC needs to make sure that the right message and information are getting through to the dealers.

Thirdly, VTC/VBC needs to improve their visibility in the reverse and forward flow. This will both facilitate accurate measuring, planning and execution of returns in the DCs and provide the dealer with feedback. Moreover, improving the visibility will make VTC/VBC more aware of their own processes in the distribution of spare parts and what they need to improve. However, improving the visibility could be both difficult and costly, but it is deemed necessary as the current situation of zero visibility is not seen as viable in the long-term for VTC/VBC as the consequences can become too severe.

6.1.2 Decreased amount of returns at VTC/VBC

The order-by-mistake category was seen to be less complicated to reduce compared to the buybacks. This is due to that the some actions are seen to be easier to implement and more straightforward. VTC/VBC is seen to have created an undesired behavior at the dealerships and before VTC/VBC starts to implement too many actions affecting the dealer it is seen imperative to adjust their own operations in order to show the dealer that VTC/VBC is committed to change as well. The suggested actions in chapter *5.3.1 Improving the replenishment setup and performance to reduce returns* with increased stock order frequency and improved delivery precision is where VTC/VBC is suggested to start. By doing so it is likely that this will facilitate the implementation of the action suggested in chapter *5.3.4 Changing dealer behavior and operations to decrease the amount of returns.* By improving their own operations it will become easier for VTC/VBC to implement actions at and together with the dealers as they can show that they are working together towards a common goal of reducing the number of returns.

Moreover, as seen in chapter *5.2.2 Modify return policies and contractual agreements* the order-by-mistake could substantially decrease by increasing the financial limit allowed to return parts and introduce limits to use for an incentive and penalty program. As these are not mutually exclusive the exact amount of returns that will be decreased is difficult to estimate, but a potential of reducing it with at least 30,1 percent was identified. This will also have an effect on the day-orders as order-by-mistake is a consequence of this order type and by hindering the dealer to send too much in the order-by-mistake category the day orders will also decrease. Moreover, restricting the amount of days the dealers has to send back the items is seen as highly feasible and this were supported by the participants in the workshops. It is possible that this would reduce the amount of manual buybacks as the dealer will become more cautious when ordering in the first place. The largest impact of this return is that the planning aspect in the CDCs will become easier as the variations is likely to decrease and the need for extra manpower and overtime will decrease. However, before implementing these actions VTC/VBC needs to make sure that this will not jeopardize the availability of spare parts since the dealer can become too careful with what they order, as the focus must be on the end-customer satisfaction. However, starting with introducing a bonus system to decrease the number of returns could be done immediately because it will only have an positive impact on the dealerships and historically this has been successful at VTC/VBC.

The buybacks was identified to be a bit more complex to reduce as it is a consequence of the processes owned by VTC/VBC that is more difficult to change. As this return is initiated by VTC/VBC, it is more about improving the actions discussed chapter *5.2.1 Improving the replenishment setup and performance to reduce returns* in order to reduce the amount of dead stock

that will eventually qualify for buybacks. It is however imperative that VTC/VBC do not jeopardize their current replenishment performance by focusing on reducing the amount of buybacks. Even though there are some constraints to reduce the amount of the buybacks, the authors argue that by incorporating the cost of these returns in the forward flow and being aware of the consequences, will improve the decision-making when changing forecast and replenishment parameters. The focus should therefore be on introducing scrap-on-site in order to reduce the amount of unnecessary returns. In many cases, the value that can be recovered from the spare parts was identified to be less than the cost of transportation and handling and should therefore be scrapped on site. The potential outcome of this suggestion was that a large portion of the transportation and handling costs for buybacks can be eliminated. However, the identified risk was that the parts can end up on the alternative market and this needs to be mitigated through e.g. contracting scrap brokers and perform regular checks at the dealers.

As some of the actions suggested were difficult to quantify, especially changing the dealers undesired behavior, the exact reduction is difficult to evaluate. However it was seen that for the quantifiable results that the total return flow in Sweden could be decreased with almost 30%. However, in combination with the non-quantifiable actions, the authors believe that the returns from Sweden could decrease with 50% since several dealers are already on that level as of today.

6.1.3 Cost reductions and decreased environmental impact

When reducing the amount of returns it comes with several benefits. One of the largest benefit is the reduced cost that comes as a consequence of reducing the returns. The current cost situation in Sweden was evaluated and some of the cost drivers could be applicable when calculating the cost globally. However, some costs differs e.g. the transportation cost in the forward and reverse flows and this has to be considered when calculating the cost on a global level. As it was identified that there is a potential of reducing the returns in Sweden with 50%, it is seen as highly possible to reduce the total cost of returns with almost the same amount. The freed up capital could e.g. be used to increase marketing efforts and help dealers to increase their sales in the aftermarket and this will also make the dealers more willing to contribute to a reduction of returns. For the European returns, the authors identified a potential cost saving of less than 50 percent since Sweden has one of the largest percentage of returns vs. sales. It is therefore argued that a potential of 30 percent cost reduction is reachable for the European market. Moreover, reaching the cost reduction of almost 50 percent in Sweden is based on the data for 2015 and it is not certain that the return rate has been consistent historically and there is a possibility that the 50 percent reduction will not be meet. Furthermore, the suggested actions have not been tested and there is risk that the targets cannot be reached. However, the goal is considered to be realistic and should act as a target more than a definite value to reach.

Moreover, lowering the amount of returns will decrease the transportation of parts both in the forward and reverse flow and this will have an positive impact on the environment. This aspect has not been considered to a large extent in the thesis but will be highly affected by the suggested actions. Reducing the amount of day-orders that is often transported by air will decrease the environmental impact substantially and therefore this aspect has to be considered and more thoroughly evaluated in order to quantify the impact. By lowering their environmental impact VTC/VBC could leverage from

it by using it for e.g. green marketing or similar to enhance their brand value and attract more customers.

To summarize the result discussion, the most important aspect for VTC/VBC is to understand that the internally owned processes have created an undesired behavior at dealers that drives order-by-mistake returns. Hence, VTC/VBC needs to work together with the dealerships when implementing the suggested action in order to effectively reduce these returns while not jeopardizing the dealer or end-customer satisfaction. Moreover, reducing the buybacks is highly influenced by the operations at VTC/VBC, where accurate forecasting and replenishment parameters are of the utmost importance. As this thesis has shown the consequences of the large amount of returns and what actions that could be taken to reduce it, VTC/VBC needs to evaluate the trade-off between availability, customer satisfaction and cost. This in order to evaluate their current processes and operations to ensure that it is inline with the overall business goal of the organization.

6.1.4 Validity of the result

The validity of the result will mainly be discussed from the framework presented in chapter *5.3 Summarizing framework for analyzed drivers*. For some of the drivers found, and evaluated in the framework, similarities was found both in the empirical data gathered and the theoretical findings and this increases the validity of the result. To increase the validity further the result could have been tested on an other industry as well to secure that the discovered drivers are applicable in other industries. However, the theoretical findings used to support the drivers have been collected from sources that have been discussing RL in other contexts.

That the dealer behavior was driving the need for RL was however not found in the literature, it only became apparent in the empirical findings and that this is a driver for RL in other contexts was therefore difficult to validate. The underlying mechanisms of the identified drivers were based on using a root cause analysis, which is considered to be a well-known and valid tool to investigate them. However, the underlying mechanisms are based on the data collected at VTC/VBC and validated by internal employees, which is seen to decrease the overall validity as the underlying mechanisms could be too context-specific.

Moreover, the qualitative data gathered for the result is mainly gathered through interviews with employees from different departments and on different levels within VTC/VBC, which increases the validity. Moreover, the quantitative data has been collected from several sources and the findings from the quantitative data has supported the findings gathered from the qualitative data, which is seen to increase the validity of the drivers and underlying mechanisms found. Furthermore, the identified drivers derived from examining the Swedish market and Swedish dealers, which is seen to lower the validity. To increase the validity of the found drivers and underlying mechanisms, more information could have been gathered from other markets within VTC/VBC to find similarities and differences.

The suggested actions were first developed through interviews with different employees at different departments and positions within VTC/VBC. Furthermore, the actions were not tested as such but they were validated through two workshops with representatives from several departments agreeing

on which actions that should be taken. The feasibility of the suggested actions and whom is responsible for the implementation of them was considered during the workshops, which is seen to contribute to a high degree of validity. Moreover, some of the actions could be quantifiable in terms of what impact reduced amount of returns could have on both cost and the environment. However, the suggestions were mainly discussed with VTC/VBC and only a selected number of dealers, which decreases the validity of the suggested actions. The authors did not have a chance to test any of the suggested actions, which made it difficult to see the feasibility and impact of the actions, which decreased the validity of the suggested actions. As a consequence the work behind implementing some of the actions were not investigated and what exactly is needed to make the actions work and how much they can contribute to a reduction of returns. Therefore, some of the actions can turn out to not provide VTC/VBC with the expected result.

6.1.5 Generalizability of the result

As discussed, some gaps in the academia were identified when the drivers of RL within VTC/VBC were developed. Hence, it is argued that the results from this thesis can contribute to further research within the area of RL.

As the thesis was limited to VTC/VBC and especially focused on the Swedish market, all drivers may not be applicable in all countries that the company is currently present in. The Swedish market was identified to be very complex when it comes to end-customer demands and how dealers are currently replenished. However, it is argued that using the developed frameworks for identifying drivers and its underlying mechanisms is an efficient way in order to work actively with reducing the returns in other countries as well. Moreover the complexity of Volvo Group, which involves a wide range of different brands and processes, further implies that to generalize the identified driver over the organization needs to be further investigated. However, it was briefly discussed and tested on Renault Trucks with a positive result strengthening the drivers, which enhances the generalizability. Although, the area of RL was identified to be somewhat of a black hole not just within VTC/VBC. Hence, the need for attention towards this area is argued to be relatively high and this thesis can therefore facilitate Volvo Group's future work towards identifying drivers, consequences and actions of RL for all their brands.

When evaluating the findings within other automotive industries, the authors argue that the drivers needs to be adapted to the specific context and this is highlighted by one of the drivers found in this thesis. The nature of a truck or bus is argued to be different from e.g. cars and to apply the results in that industry the authors argue that this driver needs to be highly emphasized. The results is seen to work as a foundation when investigating the drivers of RL in e.g. the car industry. Hence, all the identified drivers may not be applicable in all industries and companies may find other key drivers and underlying mechanisms that are more important in their context compared to the context of VTC/VBC. It is therefore suggested to mainly use this report as inspiration, while adapting the findings to the specific industry.

The developed actions in this thesis are mainly targeted towards the identified drivers and its underlying mechanisms. The generalizability of the actions is therefore seen to be relatively low in

general. However, it is seen plausible to implement the suggested actions in other countries within VTC/VBC, which will increase the generalizability. There are many countries where the context is similar to the Swedish, such as the Nordic countries, where the authors argue that the same actions could make a substantial difference. If Volvo Group chooses to implement similar actions within their other brands, deeper analysis of the drivers applied to each brand needs further attention in order to secure that the suggested actions is truly affecting a driver and its underlying mechanisms. The authors do however argue that many of the actions can be applied to other brands as well, since there are many similarities in e.g. processes, policies and contextual factors.

Moreover, to apply the actions at other automotive companies, the importance of identifying the key drivers and its underlying mechanisms to the specific company cannot be stressed enough. Changing e.g. policies and contractual agreements can always affect the outcome of RL, which was also argued in theory to be a key driving factor. However, adapting e.g. the replenishment setup and changing dealer behavior may not be the optimal solution in the car industry since that context may require other ways to counteract the consequences of RL. Furthermore, the actions much like the drivers, can work as inspiration to other industries as well when working with reduction of returns. However, the authors argue that if other companies uses the same logic as the thesis by identifying drivers of RL and their underlying mechanisms, the actions to reduce the amount of returns becomes quite clear even in other industries.

7 CONCLUSION

This chapter will summarize and highlight the most important findings and aspect of the thesis. This will be performed from a research question perspective, where each research question will be evaluated and important aspects will be highlighted.

The purpose of the thesis was to quantify and analyze consequences of the current reverse flows and to identify driving factors of returns. This in order to develop appropriate actions, which can reduce the total amount of returns within VTC/VBC. The RL was mainly analyzed for two return codes, with the main purpose of securing availability of spare parts at the dealers. It became evident that returns are needed due to the contextual factors described by Wagner *et al.,* (2013) and Cohen *et al.,* (2006). However, the current reverse flows at VTC/VBC indicated that there was room for improvement as some countries almost had ten percent returns vs. sales whereas others had less than three percent.

RQ1: What are the consequences of the current reverse flows within VTC/VBC?
A mapping of the current return situation was performed by the authors in order to understand the current situation and also to target further analysis towards a specific market with a high rate of returns. The map is showing the percentage of returns for all countries within Europe that VTC/VBC are present in. The colors of the map are categorized from the numbers provided by Inmar Reverse Logistics (2009) where the industry average was 5 percent and above 6 percent was therefore considered poor. The main purpose of the mapping was to provide an overview of the current reverse flows within VTC/VBC.

Moreover, the complexity of the reverse flow was realized when a more in-depth analysis was conducted on the Swedish market, where it was identified that variations in return patterns appeared not only on a national level but on a dealer level as well. The quantitative data, such as costs and exact volumes, is however limited in the report since some of the information is confidential. Moreover, it is a common issue that companies do not understand the importance of RL and it is often considered to be a necessary evil (Vachon *et al.*, 2014) and this was apparent at VTC/VBC. When VTC/VBC realized the magnitude of the reverse flow and the consequences of it, they started to realize the profit and value that is lost when not actively working with it. It can therefore be concluded that the consequence of returns for VTC/VBC was that a large amount of money was spent on it. The organization did not know anything about it and when VTC/VBC understood the situation they also understood the potential of it. Moreover, it can be concluded that organizations in general need to be aware of their reverse flows and its consequences in order to understand the potential and this is also highlighted as an important factor when considering RL by Mollenkopft *et al.* (2011), Mollenkopft (2010) and Vachon *et al.* (2014).

RQ2: What are the underlying mechanisms in the current setup that drives returns?
In order to work actively with reducing the amount of returns, understanding the underlying mechanisms is imperative. It was identified that there are five key drivers to RL at VTC/VBC, each with its own underlying mechanisms that are currently affecting the amount of returns. The authors

identified both similarities and differences in what was found in the theory and at VTC/VBC concerning the drivers of RL and its underlying mechanisms.

When concluding the key drivers, it is imperative to differentiate between drivers for order-by-mistake where the returns are dealer-initiated and buybacks where the returns are VTC/VBC-initiated. It was found that the same grouping of drivers could be done, however the underlying mechanisms were different. For the order-by-mistake category a key driver was the dealer behavior and it was seen that this behavior derived mainly from the four other drivers controlled by VTC/VBC. Moreover, the largest driver for buybacks was the replenishment setup and performance and the main underlying mechanism was inadequate forecasting and replenishment parameters. The amount of buyback returns can therefore to some extent be seen as a measurement of forecasting accuracy. As a conclusion, VTC/VBC has to understand the differences between order-by-mistake and buybacks and their underlying mechanisms in order to differentiate the two return codes.

It was also seen that the underlying mechanisms in isolation did not necessarily create a driver for RL, but combined with other underlying mechanism it could become a significant driver of RL. To explain this in a metaphor, gunpowder without fire cannot create an explosion, but together the consequence could be devastating. One reason for why the different underlying mechanisms are apparent is that different decisions have been taken at different levels and departments within VTC/VBC. When these decisions were taken, the decision-makers did not understand what consequence this could have on the reverse flow and this is not because they are incompetent. It is more because the reverse flow is not seen as a strategic activity and had received almost no attention as mentioned when concluding research question one. Not seeing RL as a strategic activity is common according to Mollenkopft *et al.* (2011) and Wagner *et al.* (2012) and this need to be emphasized and changed at VTC/VBC.

RQ3: What are the potential actions and how can these reduce the amount of returns?
The framework for the analysis part has been the foundation for this thesis when developing actions towards improving RL within VTC/VBC. The focus has been on reducing the amount of returns rather than optimizing the operational part of the processes. Furthermore, instead of targeting the consequences, the authors used the identified drivers and their underlying mechanisms in order to reduce the returns. As distinguishing between order-by-mistake and buybacks for the underlying mechanisms is of high importance, the same goes for the suggested actions. It was discovered that the company can choose two ways to target the actions for order-by-mistake; either the processes controlled by VTC/VBC or directly towards the dealers. However, the authors argue that there must be actions towards both, while the actions for buybacks mainly needs to be directed towards the processes owned by VTC/VBC. A wide range of actions with different potential outcomes was developed to be able to choose the ones with the highest impact and lowest implementation complexity in order to focus on the right improvements. It was seen that some actions could attack several underlying mechanisms, which could therefore have a higher impact on the RL within VTC/VBC. To conclude, it is important yet again to distinguish between the return categories and that the actions needs to be directed towards attacking the underlying mechanisms and the drivers, not the consequences.

Moreover, how one decision can affect other aspects of the organization, such as availability or dealer satisfaction, was in focus when deciding upon what actions that should be implemented. The results from the matrix showed the key actions that VTC/VBC should mainly focus on. Firstly they should focus on improving delivery precision, increase stock-order frequency and establish a KPI for the reverse flow. Secondly, they should increase communication and collaboration with the dealers, change the return policies and introduce limits and bonuses. Thirdly, they should investigate the possibilities of scrap-on-site, the dealer to dealer concept and increase visibility and feedback to the dealers.

Since it is the end-customer who is the actual source to revenue, the impact on them was seen to be the most highlighted factor to consider. To improve the end-customer service and experience, the inadequate communication with dealers was considered of utmost importance to work actively with, not only to reduce the amount of returns but to work together towards common goals. The potential outcome of the suggested actions was seen to reduce the amount of returns in Sweden by 50 percent if VTC/VBC and the dealers start to work together. It is concluded that it will require some effort both from VTC/VBC and the dealers to get in control of the situation, however some actions are seen as highly feasible and could have a large impact on reducing the number of returns. Moreover, some of these actions are concluded to be applicable in other countries and in other brands within the Volvo Group as it is highly adaptable to other contexts.

The cost savings and reduction of environmental impact that can be realized from the suggested improvements is seen to be very valuable for VTC/VBC to further improve their logistics processes and enhance the customer satisfaction. Hence, a conclusion is that VTC/VBC needs to start working actively with RL and see it as a strategic activity that has great potential. Moreover, the logic used in the report was of great support for the authors to reach the findings and the results presented in the thesis. Therefore, it is seen to be highly plausible that using the same logic for other brands within the Volvo Group and other companies in similar industries in order to reach equivalent results and conclusions that this thesis did.

7.1 Future recommendations for Volvo Group and VTC/VBC

To be able to successfully reduce the amount of returns, several things must be considered since this is a complex process with many underlying mechanisms and potential actions. A stepwise approach is therefore suggested and can be very effective for this matter since there are many stakeholders and decision-makers involved. To start with, VTC/VBC needs to build trust through internal performance by improving the delivery precision, increase the frequency of stock-orders and implement a returns vs. sales PI. These three suggestions are highly important to be able to show the dealers that they are committed to reducing the returns and also a prerequisite in order to go into step two. Step two is about working actively with the undesired dealer behavior by “changing the rules of the game”. This step involves the actions towards changing return policies and must be done together with the dealers by increasing the communication and collaboration. During these two steps it is also suggested that VTC/VBC are developing concepts like scrap-on-site and dealer-to-dealer, which would most likely reduce the amount of returns significantly.

Moreover, VTC/VBC must not forget that returns are needed to some extent to cope with the complex environment of the aftermarket but there is a large potential to reduce this flow. It is imperative to communicate the message of why returns occur and what consequences it has on the organization. Up until now, decisions have been taken in isolation without considering the reverse flow and this have had negative consequences for VTC/VBC. Explaining the importance to the concerned departments of not taking decisions that would increase the returns is something VTC/VBC needs to actively work with in order to manage their returns. Moreover, returns also have a commercial purpose and instead of spending a lot of money on the large return flows, these financial resources could be used to something better. The financial resources could instead be used for marketing or to increase the end-customer satisfaction as it is shown that large return flows do not have a positive impact on either dealer performance or end-customer satisfaction. The challenge with this is to find responsible employees for both instituting the suggested actions, while carrying the work forward. At the moment, the MM department are to some extent involved in the return flow, so it is suggested to start their and at work their way through the organization.

Finally, by using the logic explained in the report and the framework shown in figure 44 and 45, Volvo Group could start to investigate their reverse flows within other countries and brands as well. Finding drivers, consequences and actions that targets the underlying mechanisms is seen to be a very effective method to use in other contexts as well. It is however believed that returns are difficult to mitigate completely in the automotive industry but when not understanding why it occurs and its consequences, it can create large unnecessary costs. It is therefore suggested that Volvo Group starts to investigate the reverse flows within other countries and brands in order to create a competitive advantage through effectively handling their RL.

7.2 Future research within the area of RL

When conducting this study, it became evident that this area has received little attention within a large multinational organization, which indicates that there is room for improvement within other companies and industries as well. Moreover, this thesis was performed in a B2B-context and only between OEM and dealerships and are therefore highly influenced by factors within this context. It is therefore suggested that further research could be performed in e.g. a B2C or OEM-to-supplier environment by using the same logic as this thesis to be able to compare the outcome.

Moreover, future research is needed within other industries in order to develop a more generalizable framework for identifying driver and actions towards the return flows. The identified drivers in this thesis does not consider external factors such as legislations and environmental factors since it was conducted in a B2B context with focus on commercial returns. Therefore, the effect of such drivers is suggested to be investigated in other contexts with other types of returns.

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APPENDIX

Appendix I. Interview template

General template used in all interviewees:

What is role and can you describe it briefly?

Explain the process of a buy back return.

- Can you explain the process of this return category?
- What is the purpose of it?
- What do you believe is the driver in this return?
- Do you see improvement areas?

Explain the process of an "order-by-mistake" return.

- Can you explain the process of this return category?
- What is the purpose of it?
- What do you believe is the driver in this return?
- Do you see improvement areas?

Explain the overall process of returns

- Operational aspects:
  - How is the returns handled and transported?
  - Room for improvement?
- Is the return flow highly emphasized at VTC/VBC?

Template for upper management:

What is the purpose of the returns policy?
Are the rules for returns, simple, fair and equitable?
Do you have any internal incentives to return less products while maintaining high customer satisfaction?
Do you have any KPIs for the reverse flow?
Do you believe the returns strategy is aligned with Volvo's overall business goals?
Do you think that there should be more emphasis on the reverse flow?
Are products differentiated in order to adapt the reverse flow to them?
Where is the point of inspection?

Can products be scrapped at dealers? Why/why not?
Why is there less visibility for the reverse flow compared to the forward flow?
Do you use benchmarking to improve the reverse flow?

Template for operational personnel

What does the process of handling returns look like?

- When do you know returns will be received?
- How do you plan for returns?
- What happens to the products after they are delivered to you?
- How long is the process from delivery until they are ready-for-sale again?

Are the different return flows handled differently?
Do you believe Volvo is good at handling returns?
Is the information received of good quality?
What would you say are the most effective/efficient parts of today's processes?
What would you say are the biggest flaws of the process?
Do you manage to handle all returns received each day?
Do you have any goals how many returns to be handled?

Do you have any measurements to support improvement?

Template for transportation department

How is the transportation handled and can you describe the process briefly?

- Who is in charge of booking the transportation and make sure that it will be performed?
- How is a transport initiated?
- How specific are the contract in terms of responsibility and who is doing what?
- Does the transportation flow differ depending on country/region?
    - If yes, how does this affect the return flow?

What factors influence when choosing a carrier?

- Trade off between cost and lead-time?
- That they offer an entire transport solution?

Is the different return flows handled differently?

Is it important to optimize the returns e.g. consolidation?

How much focus is put on the return flow compared to the forward flow?

- How is the flows monitored and control?

Is Volvo responsible for the transport planning or is that the carrier responsibility?

How do you measure the transportation accuracy?

- Different depending on forward/reverse flow?

Is Volvo in charge of the transportation forecast?

- If yes, do you feel that forecasting accuracy is satisfying?

Using transportation management system? Both forward and reverse flow?

What kind of improvements do you see?

Template for dealer:

Initial questions:

What services do you offer?

What kind of customers do you have? (e.g. gold, silver, blue contract or fleet owned vehicle/self owned vehicle)?

What is your role/assignment?

*Planning***:**

How do you plan for maintenance?

When a customer calls in with a problem, how is that process handled?

- SOP-procedure? Same person always talking these calls or does it differs?
- How do you diagnose the truck?

Does the information received from the customer depend on which type of customer it is (e.g. gold, silver, blue contract or fleet owned vehicle/self owned vehicle)?

- If yes, do some customer provide better information that facilitates the planning?

After diagnosing the vehicle, how do you place orders?

- Do you consider stock orders that are to be delivered?
- Do you always place day orders to fill the gaps in the inventory?

How do you work with preventive/corrective maintenance? How does it differ in terms of planning, ordering process etc.?

Do you use connected vehicles and how?

*Returns***:**

Explain the process of a buy back return.

- Follow-up questions:
    - How do you decide what will be sent back and not?
    - When do you send it back?

- How do you estimate the weight?

Explain the process of an "order-by-mistake" return.

- Follow-up questions:
  - Do you send back the part as soon as you know it will not be needed?
  - Do you believe that you have 42 days until return is necessary?

Explain the overall process of returns

- When do you send it back?
- How do you book a transport?
  - Do you believe that this is a good way to handle this?
- In average, how long time does it take to get your money back?
  - Do you see this as a problem?

Is the information you receive from Volvo of good quality?
Do you believe that buy backs and "order-by-mistake" /free returns) increases the end customer satisfaction?
Do you consider that the order by mistake and buy backs is a necessity to reach an appropriate service level?
Does the periodic buy backs happen with the right frequency and in the right quantities?

Feedback to VTC/VBC:
Are you satisfied with the returns process?
Where is Volvo lacking when it comes to return flows? What can they do better?
What do you believe that you can do to make the process better for VTC/VBC?

Template to administrative personnel:
How is the process of handling returns designed?

- Who is the initiator?
- What triggers the return?
- What kind of administration is needed?

What articles are mainly sent?
What is the time from initiated return-credit?
Are there any limitations for returns?

- Number of returns?
- Value?

Are the process effectively/efficiently handling returns?
Is the information received from dealers and Volvo of good quality?
Are there any incentives/penalties for the reverse flow?
Do you use any KPIs?
Do you believe you facilitate the process as much as possible for the dealers?
Do you have a lot of issues with the administration? Why?
Are dealers mostly happy with the returns process?
What can dealers do differently to facilitate your process?

Template for financial departments

How are the financial flows and processes conducted with returns?

- For general returns?
- For order-by-mistake returns?
    - Who is involved?
    - How long is the time to credit?
    - How often are dealers credited?
    - Any control mechanisms involved in the financial flow?
    - Invoice connected to each return?
    - What are the costs involved when dealing with returns?
        - Monetary means?
        - Volumes?
        - Handling and transportation cost?
- For buyback returns?
    - Who is involved?
    - How long is the time to credit?
    - How often are dealers credited?
    - Any control mechanisms involved in the financial flow?
    - Invoice connected to each return?
    - What are the costs involved when dealing with returns?
        - Monetary means?
        - Volumes?
        - Handling and transportation cost?