Securing the Just-In-Time delivery for the after-market
— Study at Volvo Car Customer Service

Olivia Allgurén    Sanna Patama
Summary

The thesis has been performed at Volvo Car Customer Service in Gothenburg, Sweden. The output from the study will support Volvo to secure the Just-In-Time delivery of referrals for the after-market. The scope was limited to referrals from pre-planned orders, which occurs when there is no availability in the distribution centre where the orders were placed.

Volvo’s main warehouse in Europe is the Central Distribution Centre, which process referrals. The warehouse had an ongoing organisational change during this study. The concern was that the change would not lead to optimal conditions for processing referrals for different markets. It was therefore important to preserve the market knowledge in order to maintain a reliable referral service.

A qualitative study was used and the information was gathered primarily through semi-structured interviews. Literature was studied both initially and continuously through the study. Analyse of the literature, current situation and data collection generated ideas for possible ways of securing the referral process and improvements. Benchmarking and Workshop was also performed in order to obtain further ideas.

The result of this study was an information material containing information about all concerned markets, overview of referral flow and information regarding how the Central Distribution Centre needs to print referrals. The proposals suggested for future work were explained in long- and short-term. The short-term suggestions include use of the developed material in order to preserve the knowledge along with providing correct working conditions. For long-term suggestions focus has been on how to reduce or remove the printing problem. For future work Volvo Car Customer Service should consider these proposals in order to secure and improve the referral service.

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Preface

This Bachelor thesis was performed at Volvo Cars Customer Service, VCCS, in Gothenburg, Sweden. The study was performed through VCCS and University West from November 2014 to March 2015. A pre-study was performed during the first ten weeks and part of the gained information can be found in chapter 1-4. To facilitate the understanding of the figures and tables presented in this report, the recommendation is to have the report printed in colour. The authors are the creators of all figures unless otherwise stated.

Many thanks are expressed to Volvo Car Customer Service for the possibility to perform our thesis. We would especially like to thank our supervisors Per Larsson at VCCS and Ingrid Elison at University West for the support in this study. We would also like to dedicate a special thanks to Market Area Manager Bertil Andersson, the LDC-Coordinator Lisbeth Andersson and the Logistic Managers Rob Hoyer and Renzo Palavanchi for the input in this study. Employees at VCCS have our greatest gratitude for being welcoming and taking the time to talk to us during interviews, meetings, phone calls and e-mails.

Thank you is also dedicated to Björn Carlsson at Parker Hannifin Manufacturing Sweden AB in Trollhättan for all the information during the Benchmarking.

Best regards,

Sanna Patama & Olivia Allgurén
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<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCC</td>
<td>Volvo Car Corporation</td>
</tr>
<tr>
<td>VCCS</td>
<td>Volvo Car Customer Service</td>
</tr>
<tr>
<td>CDC</td>
<td>Central Distribution Centre</td>
</tr>
<tr>
<td>LDC</td>
<td>Local Distribution Centre</td>
</tr>
<tr>
<td>RFS</td>
<td>Ready-for-Shipment</td>
</tr>
<tr>
<td>CDC-ABC</td>
<td>An ongoing organisational change in CDC</td>
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<td>PULS</td>
<td>Volvo Cars global part system</td>
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<td>JIT</td>
<td>Just-In-Time</td>
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<td>PRC</td>
<td>Production channel</td>
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<td>WOM</td>
<td>Word-of-Mouth</td>
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<tr>
<td>MAE</td>
<td>Market Area Europe</td>
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<td>Referral</td>
<td>An order variant for when the ordered parts are not available at LDC and is referred to the CDC</td>
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</table>
1 Introduction

The world is constantly changing, not only political but also social and economic; Monhanty & Yadav (1996) means that organisations will have to react to these changes to be able to survive and become successful. Nelson (2003) states that the most common reason for a company to go through an organisational change is because of the desire to move towards a structure that is more suitable to the situation. There could be a change in the internal or external conditions that more or less force the company into an organisational change (Ibid). Ian Smith (2011) states that active management of organisational change and organisational quality together form a powerful combination, but the challenge is to make changes and achieve quality that are maintained.

Chapman et al. (2002) describes that the global market place has affected industries to transform themselves into a truly customer-oriented and service-focused enterprises. Business organisations must constantly look for innovative strategies to improve their competitiveness to stay ahead in the modern global marketplace (Ibid). Gattorna et al. (1991) states that customer service is one of the most fundamental means available for companies to differentiate themselves.

Customer service could mean everything from technical service to export marketing and distribution services. Gattorna et al. (1991) states that last mentioned activity is one of the most important element in the consistency of lead times. It is more important for the customer to know that the stated delivery date could be relied on, than for the service lead time to be short (Ibid).

1.1 Project Scope

The study was performed at Volvo Car Customer Service, VCCS, with focus on the Just-in-Time delivery of spare parts for the after-market. The scope was to analyse referrals of class 3, pre-planned orders, and to secure the process. The scope involved to look at the referral process and only the connected markets, which means the Local Distribution Centres in Europe that process pre-planned orders. Another limitation in the study was that there would not be an implementation of the produced result and no measurement.

The intentions with this study was to get an understanding and a view of how:

- each market group in the Central Distribution Centre process referrals
- printing needs to be done in each article area in the Central Distribution Centre
- to secure that the referrals service will work as promised
- to spread the knowledge of referral service with the people that is working in that line of production
1.2 **Objective and Goal**

According to Tonnquist (2014) an objective could first be measured a while after completion of a project, but a goal could be measured right after a completed project.

The objective of this study was to secure the Just-In-Time delivery service for the after-sale markets after an ongoing organisational change. The goal was, after ten weeks, to present a suggestion regarding how to secure the knowledge about when to print for each market with underlying information material.

1.3 **Background**

Volvo Car Corporation, VCC, was founded year 1927 in Gothenburg, Sweden, and is since year 2010 owned by the Chinese company Zhejiang Geely Holding Group (Geely, 2014). Volvo has a strong focus on customers and an objective to be a lean and nimble company. One strategy is to emphasise probability and efficiency (Ibid).

Volvo Car Customer Service, VCCS, is a business unit of VCC located in Torslanda, Gothenburg. VCCS sell spare parts and provide customer service operations for the after-sale markets. The after-sale markets are customers that are located all around the world. An important task for VCCS is to make sure that the after-sale service has a good quality at the same time as the company maintain or decrease their costs.

The distribution of spare parts to dealers in Europe is mainly done with a concept called Local Distribution Centre, LDC. There are over 20 LDCs in seven countries around Europe and the concept is based on Just-In-Time deliveries to workshops through dealerships. As of November 2014 there were 15 LDCs that processed referrals class 3. A car reparation at a workshop has an order for the needed spare parts at a connected LDC through a dealer. The spare parts will through the LDC-concept be delivered Just-In-Time for the reparation. With this concept the workshops do not have more in stock than necessary.

The Central Distribution Centre, CDC, is located in Torslanda and is VCCS’ only central warehouse for storage of spare parts in Europe. CDC provides all LDCs with spare parts, see figure 1.1.

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**Figure 1.1 Connection between CDC, LDC and dealers**
In order to obtain highest availability for workshops, not available order lines in LDC will be referred to CDC, see figure 1.2. These orders are called referrals. This procedure has to be performed in a correct way to accomplish on time delivery to workshops. Incoming referrals from LDC to CDC are therefore checked against the stock balance for spare parts. If the spare parts are not available at CDC the referrals are sent to the LDC-Coordinator, who work at the European Order Office. The LDC-Coordinator work with a specific focus to solve these matters.

![Figure 1.2 Overall process for referrals at Volvo Car Customer Service](image)

### 1.4 Problem description

CDC was facing an organisational change where the purpose was to increase the efficiency and standardisation at CDC. The referrals are processed in CDC and the organisational change could affect this referral process.

If the referrals were not available in CDC they would be referred to the LDC-Coordinator. To ensure that the Coordinator has enough time to find missing spare parts, or send information to dealer, it is crucial that referrals in CDC are printed in time for each market. If referrals would not be printed the Coordinator would not receive information and could therefore not provide service. The concern was how to ensure that the knowledge from each market group would be maintained after the organisational change. The different areas in CDC were working in market groups, see figure 1.3, before the organisational change. Markets could have different agreements and it could therefore be different working ways in each market group.

![Figure 1.3 Market groups with small, medium and large articles](image)
The organisational change, which was called CDC-ABC, would divide areas after the size and frequency of articles, see figure 1.4. These article areas would process orders for all markets around the world and would have an article focus.

![Figure 1.4 The different article areas.](image)

### 1.5 Overview of previous works

A pre-study for this study was performed at VCCS between November 2014 and January 2015. The purpose with the pre-study was to understand the referral process. The goal was to create a process map from the input *incoming pre-planned order* to the output *sending spare parts*. Process maps were created for the flow in LDC and CDC.

The main approach in the pre-study was eight face-to-face interviews with employees at CDC. The interviews contributed to understanding and facilitated this study by knowing possible employees to contact for further information. The gained knowledge from the pre-study and the created material was used as a part of the current situation analysis in this study.

### 2 Methodology

In the methodology a description will be presented of the applied scientific approach, research design and the used methods along with the practical approaches, see figure 2.1. Furthermore, this chapter also includes information about reliability, validity and objectively regarding the different choices of methods and approaches.

![Figure 2.1 The sections within methodology chapter](image)
2.1 Scientific approach

The hermeneutic perspective was a base for this study. Thurén (2007) states that within the theory of science there are two main orientations, hermeneutic and positivism. The hermeneutic perspective was desired for the reason that it gives the possibility to interpret and try to understand by being open and dedicated. Positivism on the other hand searches for the absolute truth and focuses on quantifying the data to be able to make general conclusions (Ibid).

A system approach was applied for this study, where the focus is to describing the reality objectively but also focus on the synergies between different parts (Björklund & Paulsson, 2012). The intentions was to investigate connection and relationships within systems in order to understand the underlying causes. Another approaches are the analytical approach that strives to find the causes and effects and the actor approach that focus on that the reality is a social construction.

2.2 Research design

Induction, deduction and abduction are according to Björklund & Paulsson (2012) different possible ways to perform a study. With induction the subject is studied without any study of theory first. With induction the general conclusions are made based on the empirical fact. Deduction is when theories are studied and then verified with the collected information. Abduction is the third approach where it is intended to interpret the reality by theory and interpret theory by the reality. This study used abduction to be able to alternate between acquiring theoretical knowledge and acquiring knowledge about reality.

Qualitative or quantitative studies are two different approaches of collection of information (Björklund & Paulsson, 2012). Quantitative studies include information that can be measured or valuated numerical. Quantitative studies are more appropriate when a knowledge regarding a specific subject, situation or experience is desired. Interview is one of the appropriate forms of data collecting in these studies. Qualitative study was therefore applied for this study because of the possibility to obtain a deeper knowledge.
2.3 **Methods and approach**

The study was performed according to a generic project model explained by Tonnquist (2010) and is visualised in figure 2.2. The study has involved a pre-study, which resulted in process maps. The planning phases involved to work through a strategy and create a plan for the project. The planning phase included a Work-break-down-structure, Arrow plan and a Gantt-chart see appendix A-C.

![Figure 2.2 ProjectBase 2.0, a generic project model according to Tonnquist (2010) p. 397](image)

To accomplish the study’s goal; a literature study, current situation analysis, data collection, Benchmarking, Workshop and development of suggestion was done. See figure 2.3 for methods within each activity. Information collection was primarily done through interviews in order to gain a deeper knowledge but meetings, observation through guided tours and mail-contact was also used.

![Figure 2.3 Overall figure for what the project has included](image)

### 2.3.1 Literature study

A literature study could according to Björklund & Paulsson (2012) be used in order to gain a lot of information in a short time. The reason for using a literature study was because it could also help to map already existent knowledge within the studied area (Ibid).
Both academic books and scientific articles were studied through this study. The initial literature study was performed in the beginning in order to understand the background and justify the importance of the study. The collected information from published material in databases formed conditions to explain why the study was useful for VCC and organisations in general.

The chosen literature was mainly based on course literature from the programme Industrial Engineering & Management at University West during the time period 2011-2014. The used literature involved topics such as Lean Management, Logistic, Marketing, Quality, Project methodology and Organisational change. The literature was chosen in order to give a wide perspective and good understanding. In order to find information regarding subjects such as Benchmarking, Workshops and scientific approaches other literature was used. All the studied literature was published after year 2000 and the authors were well known within their fields. The literature seemed therefore to be of a high quality.

Further, information was collected through the study of journal articles. The search for journal and conference articles was performed using the databases Emerald Insights, SwePub and ScienceDirect. The used keywords for the searches were: Logistic, Secure, Knowledge, Distribution, Distribution Centre, Customer Satisfaction, Service, Customer, Organisational Change, Ensure, Quality, Reorganisation and Benchmarking. The different suggestions of articles were browsed through to find appropriate scientific articles based on the article title. Thereafter, the abstract were read and additional sorting based on relevant information was made until a manageable number of relevant scientific articles remained.

During the search for articles there were mainly three criteria for which articles were interesting for this study. Firstly, only full text available articles were used to be able to read and understand the entire article. Secondly, the search applied for scientific articles to ensure a level of quality. To estimate that an article was scientific the article structure were studied. The criteria for scientific article was to include abstract, be peer-reviewed and published in a journal. However, some article that was not scientific articles was used because they contained interesting information according to the authors of this study. Before the decision to use an article that was not scientific, the author's previous publications was studied in order to form an opinion regarding if the material was reliable or not. Lastly, to limit the number of articles and to find the most recent research, the search was limited to articles published since year 2000. However, some earlier publications has also been studied and included because of their relevance for this study at VCCS.

Both article and literature study was done continuously in the study at VCCS in order to complement the understanding from the data collection of the interviews and in order to use the abduction approach.
2.3.2 Current situations analysis

The main approach was to collect information about the current situation. Gained knowledge and understanding from the employees that were working daily with referrals was considered important. It was important because the result of this thesis was supposed to be adapted to them. It was also important to gain knowledge and an understanding from other employees at Volvo Car Customer Service in order to receive an overview regarding the work with referrals.

The selected respondents that were working daily with referrals were chosen with help from a team leader but with consideration to the authors’ requests. The selection criteria were based on employees’ knowledge regarding referrals, years of experience in the field and different age. The information with these respondents was collected through recorded interviews. The selected employees for the overview regarding the work with referrals were chosen with help from the supervisors at VCCS for this study. The employees were chosen in consideration of position and knowledge regarding referrals. The information with these employees was collected through recorded semi-structured interviews, meetings, guided tour and contact through e-mail. The contact with employees allowed the authors to see the work from different point of views and obtain knowledge about the referral flow.

2.3.2.1 Interview

For the purpose of this study, a qualitative data collection was selected because of the possibility to obtain insight through direct contact. For this purpose to collect qualitative data, it is possible to make interviews or gain knowledge through observation in the field of study (Björklund & Paulsson, 2012). The method with interviews was chosen because it could be a more time-efficient way to gain understanding than working in the field. To perform interviews could also contribute to acceptance among the employees because the employees had a possibility to express their knowledge, point of view and concerns.

The benefits of seeing the body language and relate it to the variations in the voice makes the face-to-face interviews the best way of interviewing according to Reardon (2006). The planned interview time were 45 minutes for the employees from CDC and 60 minutes for the other respondents, see table 2.1. It is important to have enough time to avoid stress, both for the interviewer and for the respondent according to Dalen (2008). The interview guides were created and estimated to need ten minutes less than the planned time for the interview in order to have margins. All the interviews except one were performed within the scheduled time. The interview time was planned for one respondent but for the interview that took longer time, two employees showed up. The invited respondent brought a colleague without informing in advance and therefore the interview needed more time.
Table 2.1 Interview time according to plan and actual time

<table>
<thead>
<tr>
<th>Interview group</th>
<th>Planned interview time</th>
<th>Actual interview time</th>
<th>Number of interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees from CDC</td>
<td>45 minutes</td>
<td>30-60 minutes</td>
<td>5</td>
</tr>
<tr>
<td>LDC-Coordinator</td>
<td>60 minutes</td>
<td>60 minutes</td>
<td>1</td>
</tr>
<tr>
<td>CDC Manager</td>
<td>60 minutes</td>
<td>45 minutes</td>
<td>1</td>
</tr>
</tbody>
</table>

Reardon (2006) states that notes should be taken during and directly after the interviews even though it is recorded, because the memory easily fades. The notes could be used as a way of knowing what was important, which could make it easier during summarise of the recording (Ibid). All the interviews were recorded. The reason for recording was to make it possible to only concentrate on the respondents’ answers, new inputs and potential follow up questions. Directly after each interview the authors also did notes together in order to remember the important information. Later, the authors went through the audio files and summarised the interview in more detail. Each summarise was then sent to the respondent in order to verify the collected information.

2.3.2.2 Interview guide

The interviews were decided to be semi-structured, which means that topics and some questions were predetermined (Dalen, 2008). Questions and topics were therefore prepared in an interview guide. The questions were created to leave enough space for following up questions based on the respondent’s answers or reactions. Reardon (2006) states that there should not be the same interview guides for different interviews. Therefore, all created interview guides had similar structure but the topics and questions were adapted to each respondent group, see table 2.2.

Table 2.2 References to interview guides for each interview group

<table>
<thead>
<tr>
<th>Interview group</th>
<th>Interview guide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees from CDC</td>
<td>See appendix D</td>
</tr>
<tr>
<td>LDC-Coordinator</td>
<td>See appendix E</td>
</tr>
<tr>
<td>CDC Manager</td>
<td>See appendix F</td>
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</tbody>
</table>

It is according to Dalen (2008) important that an interview starts with a question that makes the respondent feel secure and relaxed. Therefore, the first part in the interview guide was always an introduction about the purpose with the study and the interview. After that, the initial questions were about the respondent’s title and work. Then the
questions lead on to other topics. The last topic gave the respondent the possibility to add or emphasise information that they felt was important. The last questions were created in order to end the interview smoothly.

Dalen (2008) states that it is important with clear and not leading questions in an interview. Most of the created questions for the interviews were open, where the respondent would have a possibility to describe with their own words and express their thought and concerns. The questions, which were not open, were intended to gather information or fact about a specific topic. The authors went through all questions before the interviews. This was done in order to create a consensus about the questions meaning and to analyse if something could be interpreted differently than it was supposed to. If something was interpret different between the interviewers or was considered as a high risk to be misunderstood by the respondent, the question was reconstructed in the interview guide.

### 2.3.3 Data Collection

The purpose with the data collection was to collect data about the lead times and cut-off-times together with relevant knowledge about each market. The data collection was initiated through e-mail contact with the four Logistic Managers at Volvo Car Customer Service, VCCS. Thereafter, telephone-interviews were performed with two of the Logistic Managers, who were not located in Sweden. The telephone-interviews were planned in order to gain more insight about the received information. Two different interview guides for the telephone-interviews were created, see appendix G.

The interview questions were sent in advance in order to perform an effective interview. The interviews were recorded and afterwards summarised. The compiled summaries were sent to the respondents for verification. The planned telephone-interview time was 30 minutes for the Logistic Managers but one interview’s duration was longer, see table 2.3. The complexity within the large markets was the reason for why more time was necessary for the interview.

<table>
<thead>
<tr>
<th>Interview group</th>
<th>Planned interview time</th>
<th>Actual interview time</th>
<th>Number of interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logistic Manager</td>
<td>30 minutes</td>
<td>30-60 minutes</td>
<td>2</td>
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</table>

The other two managers were located in Gothenburg, Sweden, which allowed daily contact if necessary. Face-to-face meetings were therefore used where the same insight about lead times and market knowledge could be gained. The purpose with the telephone-interviews and face-to-face meetings was to obtain clarity in eventual arisen questions regarding the current data.
2.3.4 Benchmarking

According to McGaughey (2002) benchmarking is all about learning how to do better. Bhutta & Huq (1999) states that the core of benchmarking is to perform improvements of “best practice” standards. “Best practice” is identified services, products or processes that are of the highest standards. Benchmarking is done through comparison of organisations that are best in the area and is a tool for development (Ibid). Tuominen (2012) states that if benchmarking is done outside the own industry, it is possible to learn to do things differently, resulting in breakthrough performance.

Benchmarking in this study was considered to be of importance. A Benchmarking was therefore performed at a company that, like Volvo, also ship spare parts to several different markets.

It is, according to Patterson (1995), of importance that there is a profit of Benchmarking. It is also important to be prepared so no time at the benchmarked company goes to waste (Ibid). The company is being kind enough to give some of their time. Therefore the authors where clear regarding the purpose and prepared questions prior the meeting.

2.3.5 Workshop

Cameron (2005) states that a facilitated Workshop is a method to manage a group of people to work together in order to achieve a specific result. A plan for the Workshop is essential to have and this plan should not be too detailed or too rigid, but it is important to have a broad structure. In order to complete a facilitated workshop, a clear and concise report should be produced after a workshop according to Cameron (2005). The report should also be given to the participants, because they would want to know how the output would be presented and what would happen with this (Ibid).

The reason for having a Workshop was to spread the knowledge of referral service, but also to have a good opportunity to brainstorm ideas about how to secure the referral service. The problem was however broken down into a more precise question in order to process it due a short session time. The problem to brainstorm ideas about was therefore how to secure the printing in time for the LDC-Coordinator. The possible ideas was discussed and evaluated during the Workshop. Thereby, the authors received and gained an understanding within the study for what suggestions that were accepted or not by the people within the organisation.

2.3.6 Develop a suggestion

After collection of data the information was compiled into text and tables based on the contents. Different kinds of information material were created as a result based on the received information from the current situation analysis and data collection. The explaining figures were created in the program Microsoft Visio.
Suggestions were also created by analysing results from the current situation analysis, Workshop and Benchmarking. The suggestions were analysed based on what problem they solved, acceptance, advantages and disadvantages along with needed resources to implement them. The suggestions were thereafter proposed based on short- or long-term. The result was handed over in connection with a presentation at Volvo.

2.4 Reliability, Validity and Objectivity

To ensure the validity of this study, the interview questions have been created with focus on clarity and not to construct any leading questions. Same questions have been asked different employees and different departments. The compilations of the interviews were also sent for validation from the respondents.

The current situation analysis and the data collection needed to be collected through oral sources since needed data was not documented. The data collection could be criticised for being unreliable and the information have therefore been carefully collected. To increase the reliability of the study it has therefore been focus on using the semi-structured interviews with different departments. Focus was on asking follow up questions during the interviews, both to increase the understanding but also to have information clarified. Another way to ensure the reliability was to ask control questions during the interviews. This was done by repeating statements with the authors’ own words to have it confirmed from the respondent. Another used technique to increase the reliability was recorded interviews, which were listen trough after the interviews and compiled. The audio files were the raw material and were available during the entire study to return to if there were any uncertainties.

The study's intention was to describe the reality objectively and there have been a focus on performing interviews with the different concerned departments to collect different point of views and opinions. Consideration has to be taken with regards to that the information has been partly interpreted by the authors. Different opinions have been addressed in this study in order to increase the objectivity.

3  Theory

In this theory section the acquired information from literature is presented. The theory is assessed as necessary for understanding this study and the connection between the business, the process and the ongoing organisational change at VCCS. The information is retrieved from literature studies within topics such as quality, logistics, marketing and Lean Production.

3.1 Service quality

Customer satisfaction is related to the needs and expectations of the customer, which in turn depends on different factors according to Bergman & Klefsjö (2010). For
customers it is not only the actual function and quality of the product that is of interest. Everything related to purchase, operation and maintenance of the product is also of interest, for example customer support. Good service may in some cases be just as important as good product performances. Service quality level depends on how customer perceive the actual service performance in relations to what they were expecting, se figure 3.1. A good service quality is to satisfy or if possible exceed the customer expectations (Ibid).

![Figure 3.1 Factors that affect the quality. Source: Grönroos (2008) p. 85](image)

To increase the image of a company’s brand a common way is according to Wilburn (2006) to promote their products, but that is not the only way to do that. A person’s experience with the company’s products and the Word-of-Mouth, WOM, is important to understand because of their possible effects. Dissatisfaction with a service function of a car dealership could through WOM decrease the number of sold cars of that particular brand. All customers are fundamentally a person with feelings, which could have an effect on the repurchase behaviour in the future (Ibid).

Dissatisfied customers could change a company’s image negatively due to WOM, even though it is an indirect effect according to Kang et al., (2007). Customers are most likely to apprehend WOM trust worthier than other channels of communications because the information is based on real experiences (Ibid).

Heyesa & Kapur (2012) also stated that if the supplier does not treat a customer in a correct manner the emotions could influence the customer’s behaviour and lead to a change of supplier. This may not be the only reaction. Unsatisfied customers are in many situations likely to share their experiences with other people. With today's
development of the Internet and use of social media these experiences could quickly be spread (Ibid).

The spare parts supply, as a part of the after-sales-service, is an important competitive weapon according to Pfohl & Ester (1999). The stock level of customers is dependent on the reliability in delivery time, which is the most important quality feature, see table 3.1. A high reliability means that the promised delivery date is met. The longer and more uncertain the delivery time is the higher will the stock level be. The customers have to be notified if anything changes with the time of delivery. To have a high quality in delivery means that goods are delivered with no damages and the right kind and amount of articles are sent (Ibid).

**Table 3.1 The three most important quality features in the spare parts supply**

<table>
<thead>
<tr>
<th>Importance</th>
<th>Quality features</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Delivery reliability</td>
</tr>
<tr>
<td>2</td>
<td>Delivery time</td>
</tr>
<tr>
<td>3</td>
<td>Quality of spare parts</td>
</tr>
</tbody>
</table>


### 3.2 Organisational change

There are various internal and external factors according to Dawson (2002) that could trigger an organisational change. Two factors are; when an organisation becomes more complex the bigger they become and the need to meet new competition both domestically and abroad (Ibid).

An important task for an organisation that is going through a change is to optimise different functions in a way that ensures that the company’s goods or service is successful on the market (Dawson, 2002). Erlandsson (2002) states that to be able to secure the efficiency of an organisation it is important to determine how the communication could be improved. If the communication between the hierarchical levels is inadequate it could effect an organisational change in a negative way. Many different researches have shown that the involvement of employees will lead to a better change process (Ibid).

### 3.3 Distribution service

One parameter that affects the service quality is, according to Axelsson & Agnal (2012), the service delivery. The delivery could also includes distribution, which are activities such as transports and storage. The first activity relates to availability that could describe the level of service to customer. Every order has one or more order lines, which are lines with requested articles, see table 3.2. For example, 95 percent
availability means that 95 percent of all incoming order lines could be delivered at once. Other activities, like storage, are also necessary because the parts have to be in the warehouse to be able to be delivered to the customer. A large storage could improve the availability and thereby improve the service for customer. However, large stock could in example tie up capital and therefore there has to be an optimal combination of those two. Additionally, new delivery concepts such as Just-In-Time have been created, which positively affect both the service and tied up capital (Ibid).

Table 3.2 Exemplified table of how an order system may look like

<table>
<thead>
<tr>
<th>Order</th>
<th>Order line</th>
<th>Article</th>
<th>No. of articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order no. 1</td>
<td>Order line 1</td>
<td>Article no. 1</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Order line 2</td>
<td>Article no. 7</td>
<td>1</td>
</tr>
</tbody>
</table>

3.4 **Lean Production**

Lean is according to Modig & Åhlström (2012) a business strategy that prioritises the efficiency of the flow in front of resource efficiency. One approach that could be used is visualised in figure 3.2. Values define how an organisation should be, principles how an organisation should think, methods what an organisation should do and tools define what an organisation should use. The groups show how the approach could be used on different levels of abstraction. A Lean business strategy could therefore be implemented in different ways (Ibid).

Figure 3.2 Lean strategy on different levels. Interpreted from Modig & Åhlström (2012) p. 140

Liker (2009) describes Lean with 14 management principles, below is eight principles shortly presented that are relevant for this study. All the information with regards to these principles is gained from Liker (2009) if nothing else is mentioned.

**Principle 1 – Management decisions on long-term thinking**

Decisions should be made with regards to long-term thinking, even when it is at expense of short-term financial goals. The best solution for reaching short-term
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Economical goals is not always the best in the long run. To “do the right thing” with everything that is performed will benefit the company in the future.

**Principle 2 – Create continuous process flows that do not hide the problem**

Change of work processes could improve the value of the process. This means that all kind of waste should be eliminated. Examples of waste are overproduction, wait, unnecessary transports, unnecessary/wrong processing, unnecessary large stocks, unnecessary movements, wrong products and unused creativity by the employees. The principle states that it is important to clarify the flow for the entire organisation in order to work with continuous improvements and development of people within it.

The Japanese lake is an expression that is used within Lean Production where the rocks are problems and the water represent the size of the storage, see figure 3.3. The problems, the rocks, will be visible when the level of water, the size of the storage, is lowered. The problems must either be dealt with or the boat will run aground.

![Figure 3.3 Hidden problems under the surface in the Japanese lake. Source: Lumsden (2012) p.309](image)

**Principle 3 - Let the demand control in order to avoid overproduction**

The meaning of Just-In-Time, JIT, is that the customer receives the demanded quantity of what they need at the right time (Liker, 2009). Oskarsson et al., (2013) states that a pulling system is used when articles are delivered to customers on their demands. The pulling system could lead to efficient use of capital but is more sensitive to disturbances. If something goes wrong it will be clearly visible. Another typical characteristic for the pulling system are short lead times (Ibid). Some companies are willing to pay extra for that pulling service (Liker, 2009). This system is the idealistic state of JIT: to give the customer what they want when they need it and in the quantity they want (Ibid).

**Principle 5 – If necessary, stop the process to solve the problem**

Jidoka is a Japanese terminology used within Lean Production and is used for a combination of automation and human intelligence. Jidoka means mainly that quality is built in or that the process is secured so it would not be possible to do wrong, or at least almost impossible to do wrong. A way to accomplish this would be to stop the
process together with visible or audio signals. The part of the process that was in the need of help should then receive this help from an extra resource. Another part of this principle describes error-proofing that is a sort of error protection, which secures that there will not be any mistakes.

**Principle 6 – Standardised methods**

Stable, repetitive methods should be used everywhere in order to obtain predictability, timing and a continuous flow from the process. This is according to the principle the base of the flow. The best know way of working in a process should be standardised. Creativity and individual participation of improvements of the standard should be encouraged, which is a condition for continuous improvements.

**Principle 8 – Trustworthy, tested technique**

Use technique to support the people and not in order to replace them. Usually the processes should be worked through manually at first before the technical solutions are added. It is important to have a stable process, new technique could be untrustworthy to a beginning or threaten the organisational culture. However, new techniques could help to improve the process and therefore ideas about technical solutions should be encourage within the organisation when new work methods are being created.

**Principle 9 – Develop managers & Principle 10 – Develop individuals**

A manager’s goal is to develop people to become strong employees that are using their ability to think. It is important that the managers have a vision of what needs to be done, have the competence to do it and have the ability to develop the employees so they could understand it and perform a good job. Brilliant individuals and teams should be taught to work according to the company’s philosophy in order to obtain good results.

### 3.5 Efficiency in picking

Lumsden (2012) states that there are no overall methods to determine the idealistic placement of a part, but there are a few principles that can contribute as a guideline. For example: rotation of the products, picking position, popularity, similarities and size. The principle for popularity is based on an ABC-dividing of the parts by volume and the frequency of the picking, which leads to less transportation. Usually there are a few parts that are of high frequency, called A-parts, a few parts that are of medium frequency, B-parts, and many parts that are of low frequency, C-parts. With the principle for popularity the parts are placed after what ABC-group they belong to. The parts with high frequency are placed close to the shipping. With this kind of dividing the transportation for picking will reduce (Ibid).

According to Lumsden (2012) there are several different ways on how to pick an order, two of them are shown in figure 3.4. As seen in the figure one way is to pick
the order in a part of the storage area, pick by the zone. The greatest advantage with this is that large volumes and sizes of orders can be processed. The disadvantage is that there is a need for a special area and staff that will sort the orders together. To pick an order in the entire storage area, pick by the order, means that a picker will process a full order and transport through the warehouse to pick the parts. The disadvantage with this is that the efficiency of picking will be low due to the long distances of transportation for the order to be complete. The transportation usually takes longer time than the actual time for picking and the volume that can be processed will also be low. The advantage of this way of picking is that the orders are processed separately, which means that the risk of mixing parts for different orders is low. Another advantage is that there is no need of an area and staff for assortment of the orders (Ibid).

![Figure 3.4 Two ways of packaging according to Lumsden (2012) p. 505](image)

### 3.6 Distributing centres

A distribution centre is a function for storage and/or reloading of components, finished products or spare parts (Storhagen, 2003). These kinds of centres are close to different markets to be able to give their customers a good service and to be a buffer for fluctuations in production, distribution and demand. With a combination of different flows and transport the cost for transportation could decrease (Ibid).

It is sometimes desirable to have distribution centres at different locations, but usually this means increased storage according to Oskarsson et al. (2013). One reason to have both Central and Local Distribution Centres is that there are long distances between the customer and the distribution centre. Therefore the distribution centres are spread out over a large geographical area. It is important that spare parts have a short delivery time, which a Local Distribution Centre could offer. For a company to receive orders on their main products it could be essential that the after-market service is working (Ibid).
4 Current situation analysis

The collected information from interviews and meetings are presented below. The chapter will start to explain two different types of distribution centres. The ongoing organisational change will thereafter be presented along with information that will help to understand the current situation at Volvo Car Customer Service.

4.1 Central Distribution Centre

The Central Distribution Centre, CDC, is according to Andersson (1) located in Gothenburg, Sweden, and is the only central warehouse for storage of spare parts in Europe. There is one main manager that has 18 group leaders for around 600 employees. CDC has an area of 110 000 square meters, an outbound delivery at two different location and approximately 80 000 spare parts in stock; some of these parts are in stock for up to ten years. CDC is gradually becoming more like a refill centre because most of their customers are distribution centres, Andersson (1) summarises. See appendix H for the process flow of incoming orders in CDC to outbound delivery.

There are according to Spång & Aastradsen (2) four different kinds of orders, see table 4.1. Ivanos (3) states that although orders of class 4 are not connected to a specific car it is important that these orders have a short lead time. If these orders are not sent in time there will be more referrals to send to the Local Distribution Centres and referrals are more demanding to handle in CDC than class 4 orders. Ivanos (3) finish by stating that more referrals would lead to more work in the CDC and an increased possibility for picking errors.

Table 4.1 Different order classes

<table>
<thead>
<tr>
<th>Order class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 0</td>
<td>Orders for vehicles off road, VOR, for the entire world.</td>
</tr>
<tr>
<td>Class 1</td>
<td>Day orders that are urgent. The orders are placed the same day or one day before shipping.</td>
</tr>
<tr>
<td>Class 3</td>
<td>Pre-planned order. Dealers can place these orders 14 days prior shipping.</td>
</tr>
<tr>
<td>Class 4</td>
<td>Refill order that is not specific for a car as class 0-3 are.</td>
</tr>
</tbody>
</table>

(1) Jonas Andersson CDC Group Manager VCCS, interview December 11, 2014
(2) Ingvar Spång LDC Manager VCCS & Susanne Aastradsen LDC Team Leader VCCS, interview November 25, 2014
(3) Stefan Ivanos CDC Group Manager VCCS, interview December 3, 2014
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When a dealer places a pre-planned order to a connected LDC it happens, according to Lundh (1) that the entire or a part of the order is not available due to 90-95 percent availability in LDC. The order will then automatically be placed in CDC as a referral. Lundh (1) summarise that it is important to print referrals in time so they could be processed by the LDC-Coordinator if the referrals would not be available in CDC. The CDC is according to Hoyer (2) the only warehouse that supplies referrals to LDCs.

The working hours for the employees at CDC are according to Larsson (3) different depending on how many hours a person is employed on. All employments have flexibility with regards to the working hours, which means that an employee could arrive earlier and/or leave later than the obligated working hours. The obligated, ordinary and flexible working hours for all the different employments are summarised and shown in table 4.2.

<table>
<thead>
<tr>
<th></th>
<th>Obligated hours</th>
<th>Ordinary hours</th>
<th>Flexible hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mon-Thurs</td>
<td>09.00-21.00</td>
<td>07.42-23.00</td>
<td>06.30-23.54</td>
</tr>
<tr>
<td>Fridays</td>
<td>09.00-19.00</td>
<td>07.42-20.00</td>
<td>06.30-23.54</td>
</tr>
</tbody>
</table>

Source: Larsson (3)

4.2 Local Distribution Centre

Andersson (4) states that the Local Distribution Centres, LDCs, is a warehouse concept with its own employees and system that started in year 2009. As of November 2014 there were 15 LDCs around Europe that process referrals class 3, see figure 4.1. All LDCs are separated from CDC, even if the LDC in Gothenburg is located in the same warehouse. The LDC in Gothenburg is used as a reference to enable Volvo Cars to keep the knowledge within the company regarding distribution centres. Andersson (4) summarised with that all LDCs have the same or similar layout and the same process. See appendix I for the process flow of incoming orders in LDC to outbound delivery.

(1) Anna Lundh CDC Group Manager VCCS, interview, December 11, 2014
(2) Rob Hoyer Logistic Manager VCCS, interview February 19 and March 2, 2015
(3) Per Larsson Logistic Manager VCCS, meeting March 16, 2015
(4) Bertil Andersson MAE Manager VCCS, meeting November 21, 2014
Figure 4.1 The current LDCs that process referrals class 3 are highlighted

Spång & Aastradsen (1) states that there are 42 dealers connected to LDC in Gothenburg and linked to these dealers there are around 400-450 mechanics and technicians. All dealers, Spång & Aastradsen (1) summarise, are located around two hours away from LDC in Gothenburg and receive goods three times per day. According to Larsson (2) all dealers are located around two hours away from the connected LDC and receive goods two till three times per day.

4.3 The organisational change

According to Olofsson (3) an organisational change program called CDC-ABC started in year 2005 and is ongoing at CDC. This change involves article areas instead of market groups. The reason for the inception of the change was a lack of space in CDC. A consultant evaluated the situation from a logistic perspective, which noticed that incoming and outgoing deliveries was at several different places. The transportation in the warehouse was seven to eight times too much according to the consultant and this is why CDC-ABC started Olofsson (3) summarise.

The purpose of CDC-ABC is according to Grozdanovski (4) to simplify and make it easy in the production. The change also focuses on the flow, which is one of Volvo’s values. Grozdanovski (4) states that it is all about having respect for the size and the work that is done. He also highlights the importance of working towards Just-In-Time. Six communication packages have been presented during year 2014 and

(1) Ingvar Spång LDC Manager VCCS & Susanne Aastradsen LDC Team Leader VCCS, interview November 25, 2014
(2) Per Larsson Logistic Manager VCCS, meeting February 19, 2015
(3) Mikael Olofsson Project Manager VCCS, interview November 25, 2014
(4) Dejan Grozdanovski CDC Manager VCCS, interview February 9, 2015
one in the beginning of year 2015. This has been done due to the importance of communication. The organisation and its conditions were included in these packages together with how, what and why. These expressions are sometimes used within the Volvo Corporation, Grozdanovski (1) finish.

Olofsson (2) states that the different areas in CDC have been divided with regards to markets, which have given each group a holistic view for the specific markets. Many areas have reached an agreement regarding service with the different markets and an effect of this is a large amount of routines and standards for each group. CDC-ABC has a focus on articles rather than markets, which makes it difficult to give special treatment to the different markets. The goal with CDC-ABC is that every area will own the entire process. Olofsson (2) finish by stating that each area would therefore own the process from inbound to outbound delivery for all the spare parts in their area.

Each article area will, according to Andersson (3), process orders for the entire world. One reason for dividing CDC in different article areas is according to Grozdanovski (1) the ability to create standards, which is an essential condition for continuous improvements. He also states that there will be several article areas that are divided after the size and frequency of the spare parts, see figure 4.2.

Figure 4.2 The overall layout for the new organisational structure

Olofsson (2) states that approximately 30 percent of the program has been done, as of November 2014. The two largest areas, medium and large represent 50 percent of the program. The two areas have to be done at the same time and will therefore cause a substantial increase in workload. If everything goes well the program will be finished before the end of year 2015 Olofsson (2) summarise.

(1) Dejan Grozdanovski CDC Manager VCCS, interview February 9, 2015
(2) Mikael Olofsson Project Manager VCCS, interview November 25, 2014
(3) Jonas Andersson CDC Group Manager VCCS, interview December 11, 2014
4.4 System

Volvo Cars global parts system, PULS, is according to Lundh (1) used for multiply functions. She states that all incoming orders go through PULS in different production channels, PRC.

No other system than PULS is according to Abdel Kader (2) used in the department where he is working. Also Johansson & Virkki (3) and Lidö (4) states that PULS is the only system that is used at their departments and that the internal network available but not used.

Olofsson (5) states that there will be more PRCs in the system PULS due to the organisational change. Each article area will have a unique PRC for each market or market group, see figure 4.3 for exemplified structure.

![Figure 4.3 The structure for the production channels](image)

4.5 Referrals

A referral is according to Spång & Aastradsen (6) placed in the Central Distribution Centre, CDC, when an ordered spare part was not available in the Local Distribution Centre, LDC. If the spare part was not either available in CDC the referral goes further to LDC-Coordinator. This is only applied when the referral was a pre-planned order class 3, see figure 4.4. It happens, according to Palavanchi (7) that referrals arrive to early to the LDC and that they ship directly, to early, to the dealers.

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(1) Anna Lundh CDC Group Manager VCCS, interview, December 11, 2014
(2) Amanj Abdel Kader employee at CDC, interview February 10, 2015
(3) Catharina Johansson & Sari Virkki employees at CDC, interview February 3, 2015
(4) Mats Lidö employee at CDC, interview February 3, 2015
(5) Mikael Olofsson Project Manager VCCS, interview November 25, 2014
(6) Ingvar Spång LDC Manager VCCS & Susanne Aastradsen LDC Team Leader VCCS, interview November 25, 2014
(7) Renzo Palavanchi Logistic Manager VCCS, interview February 17, 2015
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Day orders, class 1, and pre-planned orders, class 3, could become referrals. The two different referrals variants are not separated in CDC’s process. This means that when both order class 1 and class 3 becomes a referral they end up in the same production channel, PRC in the order-system PULS. However, Olofsson (1) states that referrals have different PRC from other variants of orders that are placed directly in CDC and that the purpose with PRC is to not mix up the orders.

Lundh (2) states that referrals usually have one till three lines per order. Also Johansson & Virkki (3) states that referrals consist of small orders and that this simplifies the work process, which is usually performed during the evening. It could sometimes be difficult to remember everything that applies for referrals Johansson & Virkki (3) finishes.

Rebrina (4) states that it would be good to know how each LDC receive the goods that is shipped from CDC, see quotation below.

“It is too bad that the employees at this department do not know how they are working in each LDC, how the goods are processed there […] it would be good if everybody that is working towards the LDCs could visit a LDC.”

Translated from Swedish, Rebrina (4)

4.6 LDC-Coordinator

The information in this section is from Andersson (5) if nothing else is mentioned. The task of the LDC-Coordinator is to search for spare parts that are not available neither in LDC nor CDC for pre-planned orders class 3, see figure 4.5. Volvo wants dealers to pre-plan their orders and therefore have this extra service. It is crucial for

(1) Mikael Olofsson Project Manager VCCS, interview November 25, 2014
(2) Anna Lundh CDC Group Manager VCCS, interview, December 11, 2014
(3) Catharina Johansson & Sari Virkki employees at CDC, interview February 3, 2015
(4) Gigo Rebrina employee at CDC, interview February 4, 2015
(5) Lisbeth Andersson LDC-Coordinator VCCS, interview February 11, 2015
both LDC and CDC to print orders so the system could check if the orders are in stock balance. If the distribution centres would not print in time the LDC-Coordinator would not have time to search for the missing spare parts. For the LDC-Coordinator to give a correct service, according to the concept for pre-planned orders, the orders that have spare parts that are not in stock has to be printed.

![Flow chart of pre-planned referrals](image)

Figure 4.5 Flow chart of pre-planned referrals. The LDC-Coordinator is working at the Order Office

The LDC-Coordinator can see if there are any referrals that were not available in CDC on a channel in the system PULS. The Coordinator can search for the missing parts for example in the factory, different balances, in the department for returned goods, earlier editions of the part and in not yet released editions. In some cases a detail could be disassembled to access the spare part. For the LDC-Coordinator to be able to do these searches the referrals that are due to be shipped from CDC the same day has to be printed at latest 07.00.

The LDC-Coordinator will have to find a solution for the missing parts the same day and has to solve it prior cut-off-time so CDC could send the parts to the LDC. The cut-off-time is different for different markets. Approximately 97 percent of the order lines in Sweden are available directly from LDC, 2 percent are supplemented from CDC and 0,5 percent are solved by the LDC-Coordinator. Therefore 99,5 percent of all order lines will be delivered complete and on time to the dealer. Approximately 0,5 percent of the order lines in Sweden will not be delivered to dealer in time. The dealer will receive this information through e-mail no later than on CDC’s shipping day. The spare part that was not available will be removed from the order and the dealer will make a decision on how to solve the situation with the missing part.

### 4.7 Printing

The printing for the Swedish market is according to Abdel Kader (1) done for todays and tomorrows referrals. These referrals are one and two days prior Ready-for-shipment, RFS. The reason for printing two days before RFS is that these

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(1) Amanj Abdel Kader employee at CDC, interview February 10, 2015
referrals have LDC’s Ready-for-Shipment date, RFS-date, thus the day they need to be shipped from LDC. Therefore, CDC has to ship these orders so they arrive in time for LDC to ship on their RFS-date. When everything has been packed the referrals for the day after tomorrow is printed, three days prior RFS, but they do not need to be packed Abdel Kader (1) summarise. Johansson & Virkki (2) and Rebrina (3) also states that the orders for the Swedish market that are three days prior RFS are printed in the evening when everything else is done. Rebrina (3) states that “I would prefer to completely remove it, it is a little strange to do so” with regards to the three days prior RFS printing. It is easy to forget to print three days prior RFS because this is done after everything else is done and sometimes employees believe that they are done for the day. He would prefer to print and package everything that is available in the system at the same time, see quotation below.

“I would prefer to print everything that is available in the production channel. The customer wants the spare parts if they placed an order. Because referrals are parts that LDC do not have that has been referred to us, then it is parts that are urgent that the customer wants”

Translated from Swedish, Rebrina (3)

All market groups, except Sweden, print everything that is available in the production channel, PRC, according to Andersson (4). The printing procedure for these markets is, according to Johansson & Virkki (2), done before 07.00 the next day. This is done so the LDC-Coordinator will be able to search for the spare parts that are not available in CDC. To have these orders already printed makes it complicated for the evening shift that are processing the orders. Usually there are just a few order lines that might be spread between different markets and there are disadvantages with this. One disadvantage Johansson & Virkki (2) summarise is the confusion of several documents.

Lidö (5) states that it is not difficult or hard to print orders in the end of the shift but that it could create some problems the next day. One problem is that there are several different papers that are in the need of processing, which could be confusing, according to Lidö (5). Wettergren (6) states that the reason for printing referrals is to receive picking labels so employees know what spare parts and amount that are needed to be picked and packed. Rebrina (3) also states that the reason for printing orders is to have a support for picking and packing orders.

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(1) Amanj Abdel Kader employee at CDC, interview February 10, 2015
(2) Catharina Johansson & Sari Virkki employees at CDC, interview February 3, 2015
(3) Gigo Rebrina employee at CDC, interview February 4, 2015
(4) Lisbeth Andersson LDC-Coordinator VCCS, interview February 11, 2015
(5) Mats Lidö employee at CDC, interview February 3, 2015
(6) Johan Wettergren employee at CDC, interview February 2, 2015
The orders that are dangerous goods have to be announced one day before shipping for markets outside Scandinavia and due to this has to be printed earlier, according to Andersson (1). Even though orders with dangerous goods, according to Hoyer (2), are pre-planned is occurs that they arrive too late to dealer and one reason for this is the one day announcement.

4.8 Instructions

Abdel Kader (3) states that there are no instructions for how to pack spare parts and that it is all about training at the department he is working at. This is different from one other department. In the department where Johansson & Virkki (4) works there are crib sheets and these are needed to be able to rotate between different works. The crib sheets include how the spare parts are supposed to be packaged and the cut-off-time for each market. It is a necessary to have these sheets so everybody knows what is applicable. The information on the sheets is available in a binder and also accessible in the computer. The binder is always used instead of the computer because it would take too long to look it up there and not everybody, Johansson & Virkki (4) summarise, has their own computer. Wettergren (5) states that laminated work instruction are available at the workbench and are used as crib sheets. Instructions are also available in the internal system, where it is possible to read how the work should be done. It is good that instructions are available because it is easy to forget, especially after vacation Wettergren (5) finishes. There should according to Rebrina (6) be instructions available for how many days prior the RFS-date referrals needs to be printed. It should be possible to find how work tasks are done in internal system. Rebrina (6) summarises that the best way to learn something is from somebody that knows but he also wants an actual paper to look at if he is uncertain. Instructions are available so that everyone could read how the work is done, someone newly employed should be able to know the work by just reading the instructions, states Lidö (7). A crib sheet is the easiest way to receive instructions and it would be helpful to have something easy accessible that is not in the computer according to Lidö (7).

(1) Lisbeth Andersson LDC-Coordinator VCCS, interview February 11, 2015
(2) Rob Hoyer Logistic Manager VCCS, meeting March 10, 2015
(3) Amanj Abdel Kader employee at CDC, interview February 10, 2015
(4) Catharina Johansson & Sari Virkki employee at CDC, interview February 3, 2015
(5) Johan Wettergren employee at CDC, interview February 2, 2015
(6) Gigo Rebrina employee at CDC, interview February 4, 2015
(7) Mats Lidö employee at CDC, interview February 3, 2015
4.9 Pending order

There are according to Lundh (1) markets with pending order systems, which mean that orders could become pending orders in LDC. Pending orders are orders with parts that are not available in LDC’s stock but will wait a few days in hope for the balance to be refilled. Orders that are for a market that do not have a pending order system go immediately to CDC if the order or a part of the order is unavailable in LDC Lundh (1) summarise, see figure 4.6.

Lundh (1) states that pending orders are used because of the possibility for LDC to receive the missing parts in stock before the Ready-for-Shipment date, RFS-date, in LDC. The order is checked towards the balance in the system at the time the order is placed. If the spare parts in the order do not exist at the LDC it will trigger a purchase order to the inventory, a refill order. The expectations are that the refill order will be sent in time from CDC to meet the order before LDC’s RFS-date. If the refill order is delivered in time to LDC there will not be a referral order to CDC Lundh (1) finish. Andersson (2) states that markets without a pending order system creates referrals in CDC that are visible up till 14 days before RFS-date in the production channels in PULS. These markets does not have these pending orders, which means that when the dealer place an order that does not exist in LDC it will go directly to CDC even though they will receive more of the spare part in stock a few days later, and before RFS-date. There is, Andersson (2) summarise, an ongoing long term work for markets to obtain the pending order system.

The most optimal way, according to Hoyer (3), would be for the LDCs to pick and pack all orders. Because the LDCs have an availability of 96-97 percent around 3-4 percent will have to be supplied from the CDC. If an order had been pre-planned, in a market that has pending orders, there would be a possibility for the LDC to receive refill from CDC. It would then be possible for the LDCs to pick and pack all order

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(1) Anna Lundh CDC Group Manager VCCS, interview, December 11, 2014  
(2) Lisbeth Andersson LDC-Coordinator VCCS, interview February 11, 2015  
(3) Rob Hoyer Logistic Manager VCCS, interview February 19 and March 2, 2015
lines because of the received refill from CDC. The pending order queue philosophy is therefore based on accomplishing the most optimised way, explained by Hoyer (1). Not all markets have a pending order system. This system is planned for both Italy and Switzerland but will, according to Palavanchi (2), not be efficient. The reason for this is the economic situation in Italy. Usually there are only a few days of work planned and therefore the dealers usually place orders around two days before the reparation day. If dealers start to place the orders earlier there would be benefits of pending queues, Palavanchi (2) summarise.

5 Data collection

This section contains the data collection of lead times, markets with pending order, order-transmission and cut-off-times for the markets that is a part of the LDC-concept. See appendix J for the complete data collection.

5.1 Lead time

There are different lead times between CDC and different LDCs, see table 5.1. The lead time depends on where the LDC is located geographically. The information for the markets Sweden and Norway is from Larsson (3), United Kingdom from Andersson (4), information regarding Germany, The Netherlands and Belgium comes from Hoyer (1) and Italy and Switzerland from Palavanchi (2).

<table>
<thead>
<tr>
<th>Market</th>
<th>District</th>
<th>Lead time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>778</td>
<td>1 day</td>
</tr>
<tr>
<td>Norway</td>
<td>878</td>
<td>1 day</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1378</td>
<td>2 days</td>
</tr>
<tr>
<td>Germany</td>
<td>2278</td>
<td>1 day</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>1678</td>
<td>1 day</td>
</tr>
<tr>
<td>Belgium</td>
<td>1258</td>
<td>1 day</td>
</tr>
<tr>
<td>Italy</td>
<td>1822</td>
<td>2-3 days</td>
</tr>
<tr>
<td>Switzerland</td>
<td>2078</td>
<td>1 day</td>
</tr>
</tbody>
</table>

(1) Rob Hoyer Logistic Manager VCCS, interview February 19 and March 2, 2015
(2) Renzo Palavanchi Logistic Manager VCCS, interview February 17, 2015
(3) Per Larsson Logistic Manager VCCS, meeting February 19, 2015
(4) Bertil Andersson MAE Manager VCCS, meeting February 19, 2015
Most markets have a lead time with one day. United Kingdom has according to Andersson (1) two days lead time because of the distance. The spare parts for the market are transported together with other parts to Maastricht in Netherlands and then to LDCs in United Kingdom, Andersson (1) summarise.

For Italy the lead time could be two or three days depending on the transportation method. There are two different ways of transport to Italy according to Palavanchi (2). On Mondays, Tuesdays and Wednesdays the shipment goes by truck and on Thursdays and Fridays a part of the transport route goes by train. The goods are sometimes late on Mondays and could depend on queues while unloading. Deliveries by train are cheaper but slower than to deliver by truck. The only way to reach a shorter lead time is to ship the goods by flight, but that would be more expensive than to ship by train and truck, Palavanchi (2) explains.

### 5.2 Pending order release

Markets could have a pending order system, see table 5.2 for which markets have applied pending orders. Not all markets have pending orders yet but are planning to implement this in the nearest future.

<table>
<thead>
<tr>
<th>Market</th>
<th>District</th>
<th>Pending order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>778</td>
<td>Yes</td>
</tr>
<tr>
<td>Norway</td>
<td>878</td>
<td>Yes</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1378</td>
<td>Yes</td>
</tr>
<tr>
<td>Germany</td>
<td>2278</td>
<td>Yes</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>1678</td>
<td>No, but will be at one LDC during spring</td>
</tr>
<tr>
<td>Belgium</td>
<td>1258</td>
<td>No</td>
</tr>
<tr>
<td>Italy</td>
<td>1822</td>
<td>No, but there are plans</td>
</tr>
<tr>
<td>Switzerland</td>
<td>2078</td>
<td>No, but will be at one LDC during spring</td>
</tr>
</tbody>
</table>

Source: Dahlbom (3)

The release is made, according to Dahlbom (3), the night before the referral is visible in CDC. The pending order are released from LDC to CDC if the parts are not available states Andersson (4). During the pending order release the balance for spare parts are checked in LDC and if there is no balance a referral is created and placed in CDC.

(1) Bertil Andersson MAE Manager VCCS, meeting February 19, 2015
(2) Renzo Palavanchi Logistic Manager VCCS, interview February 17, 2015
(3) Henrik Dahlbom Business Application Manager, meeting February 16, 2015
(4) Lisbeth Andersson LDC-Coordinator VCCS, interview February 11, 2015
5.3 Visible days for orders in system

Andersson (1) states that CDC and LDC see different number of days for referrals in the system, see table 5.3. If CDC print all orders that is visible in their production channels, PRC, in PULS the referrals might be shipped to early to LDC, according to Andersson (1). How many days earlier the orders are visible in the system including the RFS-date depends on market as well.

Table 5.3 General numbers of days visible in LDC’s and CDC’s system

<table>
<thead>
<tr>
<th>Market</th>
<th>District</th>
<th>Days visible in LDC</th>
<th>Days visible in CDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>778</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Norway</td>
<td>878</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1378</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1678</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Belgium</td>
<td>1258</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Germany</td>
<td>2278</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Italy</td>
<td>1822</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Switzerland</td>
<td>2078</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

Source: Andersson (1)

5.4 Cut-off-times and order-transmission

The cut-off-times in table 5.4 presents what time the referrals are available in CDC and after this time the order lines could be printed. The information regarding cut-off-times in CDC for the markets Sweden and Norway is from Larsson (2), United Kingdom from Andersson (3), Information regarding Germany, The Netherlands and Belgium comes from Hoyer (4) and Italy and Switzerland from Palavanchi (5).

The dealers have different order systems. The orders are transferred in batches during the day. The systems order-transmission from these systems could take some time to PULS according to Dahlbom (6). The cut-off-times and time of order-transmission are different depending on the markets, see table 5.4.

(1) Lisbeth Andersson LDC-Coordinator VCCS, interview February 11, 2015
(2) Per Larsson Logistic Manager VCCS, meeting February 19, 2015
(3) Bertil Andersson MAE Manager VCCS, meeting February 19, 2015
(4) Rob Hoyer Logistic Manager VCCS, interview February 19 and March 2, 2015
(5) Renzo Palavanchi Logistic Manager VCCS, interview February 17, 2015
(6) Henrik Dahlbom Business Application Manager, meeting February 16, 2015
Table 5.4 Cut-off-time and last order-transmission of the day

<table>
<thead>
<tr>
<th>Market</th>
<th>District</th>
<th>Cut-off-time in CDC</th>
<th>Order-transmission from dealers system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>778</td>
<td>17:15</td>
<td>Prior cut-off-time</td>
</tr>
<tr>
<td>Norway</td>
<td>878</td>
<td>17:15</td>
<td>Prior cut-off-time</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1378</td>
<td>18:00</td>
<td>Prior cut-off-time</td>
</tr>
<tr>
<td>Germany</td>
<td>2278</td>
<td>17:00</td>
<td>21:00</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>1678</td>
<td>16:30</td>
<td>18:40-19:00</td>
</tr>
<tr>
<td>Belgium</td>
<td>1258</td>
<td>16:30</td>
<td>18:40-19:00</td>
</tr>
<tr>
<td>Italy</td>
<td>1822</td>
<td>15:30</td>
<td>18:30-19:00</td>
</tr>
<tr>
<td>Switzerland</td>
<td>2078</td>
<td>15:30</td>
<td>18:30-19:00</td>
</tr>
</tbody>
</table>

Hoyer (1) states that the reason for the late transmission in the Netherlands are that several other batches with information are transferred during this time in the system.

6 Benchmarking

A Benchmarking at Parker Hannifin Manufacturing Sweden AB in Trollhättan is presented in this chapter. It was known by the authors that Parker Hannifin had a distribution centre were they for instance distributed spare parts to customer all over the world. It was also known that it was a display factory of Lean for other units within the Parker Hannifin Corporation. Parker Hannifin in Trollhättan was therefore considered as a relevant company to perform Benchmarking at for this study. The company information will firstly be presented in this chapter and thereafter the summary from an interview and observation.

6.1 Company information

Parker Hannifin Corporation was founded in Cleveland, Ohio, in year 1918 by the engineer Arthur Parker (Parker a, n.d). Fiscal year 2014 the Corporation sold for 13 billion USD and had approximately 57 500 employees in 50 counties on all continents (Parker b, 2015). This makes Parker Hannifin Corporation one of the top companies within technologies for motion and control including industry, hydraulics, climate control and aerospace (Ibid). The Corporation is divided in nine divisions where the Pump and Motor Division Europe is one of them, (Parker c, 2011). This division supplies hydraulic pumps and motors to machine manufactures and industries around the world (Parker d, 2015). A part of the production and assembly

(1) Rob Hoyer Logistic Manager VCCS, interview February 19 and March 2, 2015
is performed by Parker Hannifin Manufacturing Sweden AB in Trollhättan, Sweden (Ibid). It is according to Carlsson (1) approximately 260 employees working there.

6.2 Interview and observation through guided tour

When Parker is written it is meant to be Parker Hannifin Manufacturing Sweden AB in Trollhättan. This section presents a compilation of the interview and observation for the benchmarking at Parker. If nothing else is mentioned the information in this section is from Carlsson (1). Björn Carlsson is the manager at inbound and outbound delivery, the internal logistics, known consignor and the project manager for an ongoing change in the plant at Parker. Parker is working towards the goal to become a display factory of lean for other units in the Parker Hannifin Group.

6.2.1 Central Distribution Centre

Parker Hannifin Corporation’s only Central Distribution Centre, CDC, in Europe is located in Bielefeld, Germany. Until year 2012 there was another CDC located in Milano, Italy. It was a value added service inventory, which is an inventory with articles that is suitable for some customers. Parker Hannifin in Trollhättan is not like a Local Distribution Centre because that plant is the only location in the world where their products are available. The inventory levels of Parker’s articles are controlled from Trollhättan. It is only standard articles with a large turnover that is sent to the CDC in Germany. The CDC has complete system solutions that can be sent directly to the customer.

6.2.2 Just-In-Time

Previously Parker Hannifin Corporation had sales companies in each country that served as a hub for inventory, had sale offices and supported the customer with construction solutions and value added service. The sale companies no longer provide all that service but are only dealing with sales and finance. Articles are therefore distributed directly from different plants Just-In-Time to the customers.

6.2.3 Statistics

Parker uses a Project Quality Plan, PQP, when incorrect deliveries and incorrect material occurs. In year 2011 the outbound delivery had 3 000 incorrect pickings in one million. As of February 2015 that department had 60 incorrect pickings in one million, which is approximately one incorrect picking every third year. Parker use statistics in order to become better and to develop. When something happens that are not supposed to happen there is an investigation with an Ishikawa-diagram and a PDCA.

(1) Björn Carlsson Manager at Parker Hannifin, interview February 13, 2015
Parker evaluates the availability after measurements of the delivery reliability. Their goal is to deliver 94 percent of the customers’ requirements, which was met as of February 2015. Approximately 80 percent of all order lines that are entered today are required by the customers to be delivered tomorrow.

6.2.4 Instructions

Parker uses an online system that manages document and this system describes all instructions, pickings, deviations and exceptions. It is used while working because of the importance to review the instructions for picking. It is important since there are different instructions for packaging for each customer, country and shipping agent. When there is a new instruction available in the online system it will be marked in red and will only disappear when it has been read. It would not be possible to have the instructions printed because there are three till four changes each week. Almqvist (1) states that the outbound delivery does not use any printed document because they easy get out of date due to the constant changes that are done. Instructions in the computer are used instead where it could be easily seen when there is a new update. There is a lot that are specific to each customer which makes it important to know how different orders should be packaged and sent, Almqvist (1) summarise.

7 Workshop

This chapter starts with the structure of the performed Workshop, which was used in the approach that is described in a following section. The chapter ends with the generation of ideas that arouse during the Workshop together with the ranking of these ideas.

7.1 Structure

The Workshop’s structure was created with consideration to some guidelines given by Cameron (2005), see appendix K. The time for the workshop was short, only one hour and 15 minutes was available. Therefore, it was necessary to be prepared for how to handle unpredictable scenarios and to be aware of how long time all the activities took. The activities had an estimated duration time and the facilitators knew where during the workshop there was some flexibility in time if something outside the plan happened. There was no compiling of the aroused ideas during the Workshop with reason to keep a positive attitude and not to be critical to any of the ideas.

(1) Eva Almqvist employee at Parker Hannifin, dialogue February 13, 2015
Eight employees were invited to participate in the Workshop, but one person could not attend on the workshop day. Therefore an own meeting was held with the person in order to spread knowledge and to listen to possible ideas on the subject. All the invited employees were from different departments, see table 7.1. The participants had connection to referrals and they had different areas of knowledge. All information that aroused during the Workshop was compiled and sent to the invited participants and the Market Area Europe Manager, see appendix L.

Table 7.1 Participants in Workshop

<table>
<thead>
<tr>
<th>Participants</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant 1</td>
<td>Warehouse Employee</td>
</tr>
<tr>
<td>Participant 2</td>
<td>Warehouse Employee</td>
</tr>
<tr>
<td>Participant 3</td>
<td>Group Manager</td>
</tr>
<tr>
<td>Participant 4</td>
<td>Manager CDC</td>
</tr>
<tr>
<td>Participant 5</td>
<td>Business Application Manager</td>
</tr>
<tr>
<td>Participant 6</td>
<td>LDC-Coordinator</td>
</tr>
<tr>
<td>Participant 7</td>
<td>Regional Logistic Manager</td>
</tr>
<tr>
<td>Invited, but could not attend</td>
<td>Group Manager</td>
</tr>
</tbody>
</table>

7.2 Approach

The goal with the Workshop was to collect ideas of how to secure that referral class 3 would be in time to the LDC-Coordinator. The reason for this was to ensure that the LDC-concept would work as promised to the dealers. Pre-planned orders would be in time to the customer even if they were not available in CDC. The Workshop started with a presentation of how the process of referrals look like, see figure 7.1.

![Figure 7.1 The difference between referral class 1 and referrals class 3](image-url)
The problems with the process in order to fulfil Just-In-Time were thereafter presented. The problems were:

- Order has to be printed in time for the LDC-Coordinator but should not be delivered too early to the customer
- Several markets are processed differently
- The RFS-date for referrals class 3 are not CDC’s RFS-date

The presentation ended with the question; How can it be secured that referrals are in time to the LDC-Coordinator? After the presentations there were two sessions of brainstorming to generate ideas, a ranking of the ideas and discussion of the top ranked ideas. This is presented in the section below.

### 7.3 Generation of ideas, ranking and discussion

The set up for the generation of ideas was based on two brainstorming sessions. During these sessions the participant wrote ideas on Post-it notes of how the presented question, *How can it be secured that referrals are in time to the LDC-Coordinator?*, could be answered. The first session was done individually and the participants had three minutes to generate ideas, see figure 7.3.

![Brainstorming session](image)

Figure 7.3 Brainstorming session.

The second session was four minutes long and was performed in groups of two till three persons. The participants were encouraged in the second session to think outside the box. After each session the participants presented their ideas and placed them under an appropriate headline on an Ishikawa-diagram, see figure 7.4. This figure shows that no ideas regarding the headline *Mother Nature* was aroused and most ideas aroused regarding *method, machine and manpower.*
There were over 20 ideas that arouse during the two brainstorming sessions at Volvo, see appendix M. These ideas were ranked with the use of sticky-notes. Each participant at the Workshop received two sticky-notes, two blue and one red, to place at the three ideas they believed the most in. The red sticky-note was placed at the idea that was their first pick.

The idea fictive printing and IT-solution was put together and ranked number one. During the discussion after the ranking it turned out that all the participants agreed that fictive printing and IT-solution was the same thing. This is why the total number of sticky-notes for this idea is more than the number of participants, but it did not affect the ranking since fictive printing had the most sticky-notes anyway.

After the ranking there was a discussion of the top three highest ranked ideas and because there was some time left in the end another idea was also discussed. The advantages and disadvantages with each idea is summarised in appendix N. A discussion of fictive printing/IT-solution was that it was important to book off the balance in the system PULS so the orders PULS states exist actually do. This was according to the participants important so other referrals of class 1 would not change the balance prior the actual printing.
8 Results

In this chapter the result of developed information material and proposals will be presented, which was the goal for this study. In order to accomplish a relevant information material it was necessary to understand the current situation with the need of having the referrals printed on correct time and day.

8.1 Information material

The information material contains information about the referral flow, how referrals need to be processed in CDC in order to maintain Just-In-Time and an overview of differences between markets. The information material was established both in English, but most important in Swedish in order to be adapted for the employees in CDC. The English version is presented below.

8.1.1 Overview of referral flow

To be able to understand the referral flow it is important to understand what a referral is and why it was created. It is also important to be aware that based on which order class the dealer places the referrals will be processed differently.

8.1.1.1 What is a referral?

Referral is an order variant for when the ordered parts are not available at a Local Distribution Centre and the order is referred to the Central Distribution Centre to be able to deliver the part.

Day orders class 1 and pre-planned orders class 3 can become referrals to CDC, when there are no availability at LDC. The two different referrals classes are not separated in CDC’s process.

The difference between referrals class 1 and class 3 is that if the spare parts are not available in CDC, only class 3 is then referred to the LDC-Coordinator. The service of LDC-Coordinator is important for the class 3. It is important since the dealer has in an early stage planned the reparations and placed an order and is therefore expecting the part to be in stock, see 8.1.
Securing the Just-In-Time delivery for the after-market
— Study at Volvo Car Customer Service

**REFERRAL CLASS 3**

![Diagram of referral process for class 3]

**Why a referral to LDC-Coordinator?**
- LDC-Coordinator provides service for referrals class 3 when no availability in CDC. This is important because dealers have placed orders early and are therefore expecting the parts to be in stock.

Figure 8.1 The referral process for class 3

Referrals class 1 are urgent day orders, which means that the part should be delivered with short notice. If the spare parts are not available in CDC, no service is provided by the LDC-Coordinator because there would not be possible to deliver in time, see figure 8.2.

**REFERRAL CLASS 1**

![Diagram of referral process for class 1]

**Why not a referral to LDC-Coordinator?**
- Day order should be delivered with short notice. LDC-Coordinator cannot provide service in time for referrals class 1, when the ordered parts are not available in CDC.

Figure 8.2 The referral process for class 1

**8.1.1.2 How referrals are visible in CDC?**

Referrals class 1 and class 3 are both visible in the same production channels in the order-system PULS for the Central Distribution Centre, CDC. From this production channel referrals are available for printing in CDC. A date indicates when each order should be shipped at latest, which is called Ready-for-Shipment-date, RFS-date. The
RFS-dates are visible in a column next to the orders in the production channel, see figure 8.3. It is possible to recognise if it is a pre-planned order or a day order on the four last numbers in the RFS-date. Four zeros in the end of the RFS-date shows that the referral is a class 3.

![PRODUCTION CHANNEL](image)

Figure 8.3 Part of the visible information in the production channels for referrals

The referrals could be visible different numbers of days before the parts has to be sent, see table 8.1. The possible days the referral could be visible at most is differing depending on market.

<table>
<thead>
<tr>
<th>District</th>
<th>Market</th>
<th>Visible days in PRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>778</td>
<td>Sweden</td>
<td>3</td>
</tr>
<tr>
<td>878</td>
<td>Norway</td>
<td>3</td>
</tr>
<tr>
<td>1378</td>
<td>United Kingdom</td>
<td>3</td>
</tr>
<tr>
<td>2278</td>
<td>Germany</td>
<td>4</td>
</tr>
<tr>
<td>1678</td>
<td>The Netherlands</td>
<td>4</td>
</tr>
<tr>
<td>1258</td>
<td>Belgium</td>
<td>4</td>
</tr>
<tr>
<td>1822</td>
<td>Italy</td>
<td>5</td>
</tr>
<tr>
<td>2078</td>
<td>Switzerland</td>
<td>5</td>
</tr>
</tbody>
</table>

### 8.1.1.3 Why LDC’s RFS-dates?

Important to be aware of is that the RFS-date in the production channel can show when the referrals should be at latest sent from LDC. CDC must therefore print the referrals earlier then the visible RFS-date in the system. Orders are first placed in LDC and therefore obtain LDC’s RFS-date. If there is no availability in LDC when order will be processed, the referral is referred to CDC but keep LDC’s RFS-date. There is no functionality in the system that converts the date.
8.1.2 How referrals class 3 needs to be processed

The spare parts of a referrals class 3 needs to be shipped on a correct day from CDC to manage the Just-In-Time delivery to the customers. The day, which is the correct one to send referrals class 3 will be explained in this section. Referrals class 3 also needs to be printed on correct time and day to create correct conditions for delivery Just-In-Time. When the printing needs to be done and why will also be explained.

8.1.2.1 Why send referrals Just-In-Time?

On which day to ship referrals is important to know to be able to deliver Just-In-Time, which is not too early and not late. Late delivery means that the service has not accomplished the service promise. Too early delivery is also not correct according to Just-In-Time because the promise of which day the parts will arrive is not held. When parts have been shipped from CDC and arrives in the LDCs the LDCs usually send the referrals directly to the dealers regardless what the RFS-date is. Dealers that are a part of the LDC-concept have reduced their storage and are paying to receive the order on the day of reparation, which is Just-In-Time delivery. They usually do not have space to store orders that arrive to early.

8.1.2.2 Day to ship referrals from CDC

On which days referrals need to be shipped depends on the Ready-for-Shipment-date, RFS-date, but also the lead time from CDC to each markets. Referrals class 3 has a RFS-date that indicates when the order have to be sent from the connected LDC. This means that CDC has to send the ordered parts one to three days before the RFS-date to meet the lead-time to the LDCs. How many days earlier the parts have to be shipped from CDC therefore correlates with the lead times, see table 8.2 for the different lead-times for each market.

<table>
<thead>
<tr>
<th>District</th>
<th>Market</th>
<th>Lead time [days]</th>
</tr>
</thead>
<tbody>
<tr>
<td>778</td>
<td>Sweden</td>
<td>1</td>
</tr>
<tr>
<td>878</td>
<td>Norway</td>
<td>1</td>
</tr>
<tr>
<td>1378</td>
<td>United Kingdom</td>
<td>2</td>
</tr>
<tr>
<td>2278</td>
<td>Germany</td>
<td>1</td>
</tr>
<tr>
<td>1678</td>
<td>The Netherlands</td>
<td>1</td>
</tr>
<tr>
<td>1258</td>
<td>Belgium</td>
<td>1</td>
</tr>
<tr>
<td>1822</td>
<td>Italy</td>
<td>2-3</td>
</tr>
<tr>
<td>2078</td>
<td>Switzerland</td>
<td>1</td>
</tr>
</tbody>
</table>
LDCs are always located near the dealers. If the lead time to an LDC is one day from CDC it is as in the example in figure 8.4. The example illustrate that the delivery date to dealer is on Friday and that is the repair day. This means that LDC has to send the parts the day before, called Day -1, which is Thursday the 12th March in this case. It is also this date that is shown in the production channel as a RFS-date. If the CDC has one day’s lead time to the concerned LDC, the referral has to be processed and shipped on the day before the RFS-date, also known as Day -2. To sum this, it means that CDC has to send the parts on Wednesday, which is the actual Ready-for-Shipmenet-date for CDC but not the date visible in production channel.

![Fig 8.4 Example when the lead time is one day from CDC to concerned LDC.](image)

If the lead time to an LDC is two days from CDC, the part have to be send two days before the RFS in the production channel. This means that Day -3 is the actual Ready-for-Shipmenet-date for CDC, see figure 8.5.

![Fig 8.5 Example when the lead time is two days from CDC to concerned LDC.](image)
8.1.2.3 Why to print referrals Just-In-Time?

The printing needs to be done on a correct day and time in order to accomplish right conditions for the LDC-Coordinator service but also to deliver Just-In-Time for LDC and the customers, see figure 8.6. The LDC-Coordinator needs to have time to find the parts before cut-off-time in CDC, otherwise the parts would not be shipped on a correct day.

Figure 8.6 Activities based on if the printed orders are available in stock or not

**Printing of referrals class 3 needs to be done:**
- On a certain day, not earlier and not later
- Before or after a specific time

8.1.2.4 Time to print referrals

The process for referrals at the Central Distribution Centre, CDC, is similar regardless the order class, except for how the referrals should be printed and what happens if the referral is not available in CDC. The printing of referrals class 3 is done either after cut-off-time the day before the parts have to be shipped from CDC or before 07:00 on the Ready-for-Shipment date of CDC. See table 8.3 for the two alternatives.

Table 8.3 Today’s two printing alternatives for referral class 3

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Day:</th>
<th>Time:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The day before CDC’s RFS</td>
<td>After cut-off-time</td>
</tr>
<tr>
<td>2</td>
<td>CDC’s RFS-day</td>
<td>Prior 07:00</td>
</tr>
</tbody>
</table>
The reason for why the printing has to be done in one of these two alternatives is to secure that the LDC-Coordinator have enough time to search for the missing spare parts, see figure 8.7. This is a part of the LDC-concept and a service that is important.

![Figure 8.7 Time the LDC-Coordinator has to find spare part when there is no availability at CDC](image)

The printing is done in two different ways. Which alternative depends on which market the referral should be sent to, see table 8.4. For Sweden and Norway printing alternative 1 applies, where the printing should be done after cut-off-time the evening before the parts should be sent from CDC. The other markets have last printing deadline at 07:00 on CDC’s RFS-day. Not all markets have had all the referrals transmitted in the system before cut-off-time and therefore it would not be possible to print the evening before.

**Table 8.4 When referrals class 3 needs to be printed for each market**

<table>
<thead>
<tr>
<th>District</th>
<th>Market</th>
<th>Printing of referral class 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>778</td>
<td>Sweden</td>
<td>(day -3) after cut-off-time</td>
</tr>
<tr>
<td>878</td>
<td>Norway</td>
<td>(day -3) after cut-off-time</td>
</tr>
<tr>
<td>1378</td>
<td>United Kingdom</td>
<td>(day -3) prior 07.00</td>
</tr>
<tr>
<td>2278</td>
<td>Germany</td>
<td>(day -2) prior 07.00</td>
</tr>
<tr>
<td>1678</td>
<td>The Netherlands</td>
<td>(day -2) prior 07.00</td>
</tr>
<tr>
<td>1258</td>
<td>Belgium</td>
<td>(day -2) prior 07.00</td>
</tr>
<tr>
<td>1822</td>
<td>Italy</td>
<td>(day -3) prior 07.00</td>
</tr>
<tr>
<td>2078</td>
<td>Switzerland</td>
<td>(day -2) prior 07.00</td>
</tr>
</tbody>
</table>
Table 8.4 shows the printing-activity for each market regarding referrals class 3 and the figures 8.8-8.10 visualises the difference with consideration to the repair day. The difference is that the printing is done on Day -2 or Day -3.

Figure 8.8 Example for when referrals class 3 should be printed for markets Sweden and Norway.

Figure 8.9 Example for printing of referrals class 3 for markets Germany, The Netherlands, Belgium and Switzerland.

Figure 8.10 Example for printing of referrals class 3 for markets Italy and United Kingdom
8.1.3 Overview of all market

Referrals class 3 are printed and processed differently depending on market, which will be presented below. The factors that affect the process are lead times, cut-off-times and times for order-transmissions.

Sweden and Norway have one day in lead time and a cut-off-time at 17:15 hours, see figure 8.11. In CDC’s production channel referrals are visible on Day -3 and the last order-transmission is prior the cut-off-time. The printing of referrals class 3 needs to be done on Day -3 after cut-off-time, three days earlier than the planned reparation. The parts are packed and shipped during Day -2, which is CDC’s Ready-for-Shipment date for Sweden and Norway.

United Kingdom has two days in lead time and a cut-off-time at 18:00 hours, see figure 8.12. In CDC’s production channel referrals are visible on Day -3 and the last order-transmission is prior the cut-off-time. The printing of referrals class 3 needs to be done before 07:00 hours on Day -3, three days earlier than the planned reparation. The parts are packed and shipped during the same day, Day -3, which is CDC’s Ready-for-Shipment date for United Kingdom.

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**Figure 8.11 Process and time for printing of referral class 3 for the markets Sweden and Norway.**

**Figure 8.12 Process and time for printing of referral class 3 for the market United Kingdom.**
Germany has one day in lead time and a cut-off-time at 17:00 hours, see figure 8.13. In CDC’s production channel referrals are visible on Day -4 and the last order-transmission is at 21:00 hours. The printing of referrals class 3 needs to be done before 07:00 hours on Day -2, two days earlier than the planned reparation. The parts are packed and shipped during the same day, Day -2, which is the CDC’s Ready-for-Shipment date for Germany.

Figure 8.13 Process and time for printing of referral class 3 for the market Germany

The Netherlands and Belgium have one day in lead time and a cut-off-time at 16:30 hours, see figure 8.14. In CDC’s production channel referrals are visible as earliest on Day -4 and the last order-transmission is at 18:40 until 19:00 hours. The printing of referrals class 3 need to be done before 07:00 hours on Day -2, two days earlier than the planned reparation. The parts are packed and shipped during the same day, Day -2, which is the CDC’s Ready-for-Shipment date for the Netherlands and Belgium.

Figure 8.14 Process and time for printing of referral class 3 for the markets the Netherlands and Belgium
Securing the Just-In-Time delivery for the after-market
— Study at Volvo Car Customer Service

Italy has two days in lead time and a cut-off-time at 15.30 hours, see figure 8.15. In CDC’s production channel referrals are visible as earliest on Day -5 and the last order-transmission is at 18:30 until 19:00 hours. The printing of referrals class 3 need to be done before 07:00 hours on Day -3, three days earlier than the planned reparation. The parts are packed and shipped during the same day, Day -3, which is the CDC’s Ready-for-Shipment date for Italy.

![Figure 8.15 Process and time for printing of referral class 3 for the market Italy.](image)

Switzerland has two days in lead time and a cut-off-time at 15.30 hours, see figure 8.16. In CDC’s production channel referrals are visible as earliest on Day -5 and the last order-transmission is at 18:30 until 19:00 hours. The printing of referrals class 3 need to be done before 07:00 hours on Day -2, two days earlier than the planned reparation. The parts are packed and shipped during the same day, Day -2, which is the CDC’s Ready-for-Shipment date for Switzerland.

![Figure 8.16 Process and time for printing of referral class 3 for the market Switzerland.](image)

### 8.2 Ideas for securing the referral class 3 service

The ideas that was applicable for this study from the current situation analysis, data collection, Benchmarking and Workshop is presented in table 8.5. The ideas from the current situation analysis and data collection arouse through continuous discussions between the two authors of this study. Some ideas were generated by inspiration from the Benchmarking at Parker Hannifin and ideas was also generated through brainstorming during a Workshop.
### Table 8.5 Different ideas applicable for this study

<table>
<thead>
<tr>
<th>Ideas from current situation analysis and data collection</th>
<th>Secure printing</th>
<th>Knowledge regarding referrals</th>
<th>Continuous improvements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited view in PULS</td>
<td></td>
<td>Same information to everybody</td>
<td>Change line for pending orders</td>
</tr>
<tr>
<td>Print class 3 referrals at the same time for all markets</td>
<td></td>
<td>Practical experience</td>
<td></td>
</tr>
<tr>
<td>Automatic printing</td>
<td></td>
<td>Information regarding “why”</td>
<td></td>
</tr>
<tr>
<td>Extra resource</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CDC’s RFS-date in PRC-queue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alarm when updated instructions are not read</td>
<td></td>
<td>Distribute directly from CDC to dealers</td>
<td></td>
</tr>
<tr>
<td>Secure update of instructions</td>
<td></td>
<td>Visualising of problems</td>
<td></td>
</tr>
<tr>
<td>Print in the evening for referral class 3</td>
<td></td>
<td>Improvement with tool when problem occur</td>
<td></td>
</tr>
<tr>
<td>Only referrals with correct RFS-date in PRC-queue</td>
<td></td>
<td>Collect and analyse statistics</td>
<td></td>
</tr>
<tr>
<td>Alarm and safe mode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CDC’s RFS-date in PRC-queue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic printing</td>
<td></td>
<td>Instructions</td>
<td></td>
</tr>
</tbody>
</table>

### 9 Analysis and discussion

In this chapter there will be an analysis and discussion about the current situation and the result from this study with connection to relevant theory. The intentions of the study, which was presented in the project scope, will represent the sections in this chapter for analysis and discussion.

It was considered important to analyse the different possibilities and not exclude any ideas before evaluated them completely. The chapter therefore include analysis regarding all the aroused proposals presented in result in a compiled format.

#### 9.1 How CDC process referrals

This section presents how the Central Distribution Centre, CDC, process referrals. The information is divided in two sections that are both analysed and discussed. The first section involves the differences between the markets within the LDC-Concept.
The second section includes how the ongoing organisational change, CDC-ABC, affects referrals.

9.1.1 The difference between markets

The CDC need to process referrals class 3 differently depending on what market the referral belongs to, as presented in the overview of all markets in the result. The factors that seemed to affect the differences in printing was the lead times to LDC, cut-off-times and time for order-transmission. The printing of referral class 3 also differs in relation to referrals class 1 due to Ready-for-Shipment date, RFS-date, which was explained in the result.

The lead times affect the time of printing of referrals class 3 with regards to how many days earlier than the visible RFS-date. The lead times are different between the markets. This difference would most likely be difficult to standardise without changing the transportation method.

The cut-off-time for each market needs to be known by the LDC-Coordinator and the employees at CDC. It is important that the Coordinator have this information to be able to place orders before cut-off-time and CDC in order to plan their work. Different cut-off-times for each market would therefore lead to more information to keep in mind or require an instruction. It would however require several new negotiations in order to standardise the cut-off-times for all markets and numerous of people would have to get involved. It would also not be beneficial for the markets with late cut-off-time because it would most probably be earlier due to the transports. However, different cut-off-times for all markets might not be a problem for the employees in CDC, they cannot work with all markets’ referrals at the same time.

A standardisation of the last order-transmission could benefit the printing of referrals class 3. If the last transmission was prior the cut-off-time the printing could always be performed standardised. The time of the transmission would then not be important to take into account. This could reduce the amount of information and different ways of working in CDC. To standardise the order-transmission could however be a difficult task because it would involve many different dealer systems and people.

9.1.2 How the organisational change affects referrals

After the organisational change there will be a focus on articles and orders will be processed for the entire world in each area instead of a few markets. The differences between the markets and order classes could make it more difficult for CDC to process referrals. The advantage with article areas, as it will be after the organisational change, is that large sizes of orders could be processed (Lumsden, 2012). Referrals only have a few order lines and the advantage with the article areas would not be beneficial for referrals, which is important to understand.
The variation within the printing process depending on markets could make it difficult to standardise the work with referrals. A part of the organisational change is that the employees’ responsibility will increase, it will be easier to make changes. Changes in the referral flow require a correct knowledge about the flow and the different markets to avoid the risk of sub-optimising. An information material was therefore developed in the results chapter, which could work as an instruction and information to increase the knowledge regarding referrals class 3.

It is important to make it easy for the different article areas to process orders for different markets correctly. The preferred way would be if all markets would have a similar standardised way of working in CDC. Standardisation could, according to Liker (2009), simplify the Just-In-Time delivery and reduce the possibility to make mistakes.

### 9.2 How printing needs to be done in CDC

Printing of referrals class 3 needs to be done on a correct time and day. The correct time is after the last order-transmission and before the LDC-Coordinator arrives to work, around 07.00. The correct day is either the day before shipping or the day of shipping.

The employees that were working with referrals stated that it was important that referrals were in time to the LDCs and dealers. It was interpreted that the consequences of too early printing were not a problem from the employees at CDC’s point of view. However, one consequence of too early printing is that there could be a risk that referrals would be delivered too early to dealers. This would be a failure of the service promise of Just-In-Time with the consequences of negative Word-of-Mouth (Kang et al., 2007). Volvo wants their dealers to pre-plan but the concept would lose the purpose if the pre-planned orders would not arrive at the requested date.

One consequence of late printing of referrals class 3 would be that the LDC-Coordinator’s work would be more difficult, or not possible at all. The Coordinator might not have enough time to find the referrals that were not available in CDC. Too late printing could lead to late delivery of spare parts. The correct printing-time is therefore necessary to obtain. This is necessary in order for the LDC-Coordinator to search for missing spare parts. Below is an analysis and discussion regarding printing manually after the last order-transmission compared to print in the morning, before 07.00.

#### 9.2.1 Print manually in the morning vs. in the evening

The LDC-Coordinator prefers that referrals class 3 are printed in the evening at CDC in order to have some margin. The margin could enable the Coordinator to start working with the referrals the evening before. Germany is the market with the latest
order-transmission at 21.00. In order to standardise and print in the evening the CDC’s employees would have to print referrals class 3 after this time. One problem with printing in the evening is that the ordinary and obligated working hours ends earlier on Fridays. Manual printing in the evening would therefore not be possible in the evening for all markets. Employees would have to be obligated to stay several hours for the printing of referrals class 3, which could create frustration. It could also be seen as waste if employees were obligated to stay later for the only reason to print referrals class 3. The employees would have to wait, which Liker (2009) states are one of the eight wastes within the Lean philosophy.

To print manually in the morning have similar disadvantages like printing in the evening. The printing needs to be done before 07.00, which is around one hour prior the ordinary working hour, see figure 9.1. Employees at CDC would have to be at work earlier than the ordinary working hour. Another disadvantage is that most referrals are processed during the evening and it would therefore not be the employees that usually work with referrals that would perform the printing activity.

Figure 9.1 Analysed the printing referrals class 3 compared to the working hours.

Neither the printing in the morning nor in the evening is optimal for the employees in CDC. However, printing still needs to be done correctly to enable time for the LDC-Coordinator to provide service.

**9.3 To secure the referrals class 3 service**

It is critical to have the service of referral class 3 secured. The proposals from the results will in this section be further analysed and discussed. The ideas are analysed based on advantages, disadvantages, needed resources for implementation and acceptability from employees.
Some ideas that aroused and received higher ranking from the performed Workshop could be seen as more acceptable solutions from the employees’ point of view. Acceptance could also be greater for the solutions aroused during Workshop because of their own involvement during the idea generation process. Tonnquist (2014) states that the process for change is difficult and need to take time due to the advantage of information the implementation group has. Solutions that from the beginning are not accepted do not necessary have to be wrong to implement, but could be more difficult to process.

Regardless what kind of solutions that are desired to be implemented it is important to have support by the management to be able to implement the idea. Usually solutions will need distributed time and resources in order to be successfully implemented.

### 9.3.1 Secure printing

Printing is as of today a manual function, which is explained in the current situation analysis. It could therefore be a risk of variation in printing due to the human impact. The increased requirement on the knowledge about when to print for each market due to the organisational change could pose a risk for the process. It is therefore important to simplify the process and secure that the printing activity will be performed correctly on time.

#### 9.3.1.1 Standardised printing

In the result chapter a presentation was made for two current alternatives for when printing of referrals class 3 needs to be done. Depending on markets it was either in the morning of CDC’s RFS or in the evening before. The suggestion is to have all markets printed at the same time in order to standardise.

To gain a secure printing of referrals class 3 it is of importance to do this in a standardised way for all markets. An idea that arouse during the Workshop was to print the referrals for the LDC-Coordinator in the evening in order to have margins if the printing would have been forgotten. Only a few markets have their referrals transmitted in the system before cut-off-time. It would therefore not be possible to print all referrals class 3 the evening before CDC’s RFS for all markets, due to the working hours in CDC. The different perspectives of when to print have been analysed in section 9.2.1.

However, to establish and try to define a standard for the printing is important. To strive for standardised work is aligned with lean production and a basic condition for continuous improvements, which Liker (2009) states. Stable and repetitive methods will help to increase the quality as well by reducing variation in the method and therefore reduce possibilities to do wrong or forget to print.
9.3.1.2 Establish CDC’s RFS

As mentioned in the result, the Ready-for-Shipment date, RFS-date for referrals class 3 determines when the referrals should be sent from LDC. A suggestion that arose from the Workshop and current situation analysis was to establish CDC’s RFS-date for referrals class 3. The misunderstanding regarding when referrals should be sent from CDC and thereby simplify the printing activity is one advantage with the suggestion.

Modig & Åhlström (2012) states that it is important to reduce the risk to do things wrong. It is also important to build in quality in the process. It would be a waste to put the responsibility on the employees in CDC to count backwards for each market in order to know when referrals should be sent. The system could have the functionality. To only follow the relevant date in the system would give the employees at CDC the right conditions to do things right. This improvement would reduce the risk of wrong decision-making. The improvement could also reduce the requirements on the employees so they could focus on the correct working tasks.

Functionality within the system is required to establish CDC’s RFS and would have to be developed by the IT-department. The CDC’s RFS would also need to be adapted for each market. The development time is difficult to establish but preferably within six months in order to have the correct conditions for the future organisation. Part of the needed data for each market regarding lead times are collected in this study and may be further used.

9.3.1.3 Limited view in order to print correct referrals

A suggestion that arose from the current situation analysis was to have a limited view in the production channel in order to simplify the printing. Limited view means that only the referrals that should be printed on the same day would be visible in PULS and therefore no referrals with other dates could be printed.

An organisational culture regarding printing everything at the same time in CDC was interpreted during the current situation analysis. It seemed to be an easy working approach for the employees. As presented in the result all referrals should not be printed at the same time. Printing should depend on order class and market. One reason for this “print all culture” could be a lack of knowledge of when referrals actually should be printed in order to be delivered Just-In-Time.

A limited view in the CDC’s production channels could be one way to secure that referrals will be printed on a correct day. The advantages with a limited view are that it gives correct conditions for the employees. The suggestion would therefore reduce mistakes and it would be aligned with the employees’ “print all culture” and the desire to only have referrals with correct RFS-date in the production channel. The possibility to improve with limited view is illustrated in the table 9.1.
Table 9.1 Analysis of possibilities to create limited view

<table>
<thead>
<tr>
<th>Market</th>
<th>Days visible in CDC</th>
<th>Possible to improve</th>
<th>Printing of referral class 3</th>
<th>Suggestion Visible days in CDC</th>
<th>Suggestion Dangerous goods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>3</td>
<td>No</td>
<td>(day -3) after cut-off-time</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Norway</td>
<td>3</td>
<td>No</td>
<td>(day -3) after cut-off-time</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>3</td>
<td>No</td>
<td>(day -3) prior 07.00</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Germany</td>
<td>4</td>
<td>Yes</td>
<td>(day -2) prior 07.00</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>4</td>
<td>Yes</td>
<td>(day -2) prior 07.00</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Belgium</td>
<td>4</td>
<td>Yes</td>
<td>(day -2) prior 07.00</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Italy</td>
<td>5</td>
<td>Yes</td>
<td>(day -3) prior 07.00</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Switzerland</td>
<td>5</td>
<td>Yes</td>
<td>(day -2) prior 07.00</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

The limited view is possible to be reduced with one or two days for five current markets. The limited view for dangerous goods would however need one extra day in the production channel compared with ordinary parts. The optimal would be to solve different visibilities in the production channel for each article areas. The solution would require IT-application to develop the functionality.

**9.3.1.4 Automatic printing**

The idea of an automatic printing could secure that the printing of referrals class 3 are done in time for the LDC-Coordinator. The idea was developed through the brainstorming at the Workshop and also aroused during the current situation analysis and collection of information.

The human impact on the process, such as forgotten printing or printing wrong referrals could be eliminated with automatic printing. As mentioned during the Workshop there were a few advantages and disadvantages, which was different based on if it was a fiction or an actual printing.

Automatic printing would affect that picking list to be printed immediately, see figure 9.2. With an automatic actual printing it would be important to investigate how to handle automatically printed picking lists. These picking list are usually needed later.
during the day by the CDC’s employees in order to know what to pick and where it needs to be shipped. Some groups share printers with others and it would therefore be important to secure the process of the papers.

![Figure 9.2 The idea with actual printing](image)

The fictive printing would be an alternative solution to automatic printing, see figure 9.3. The advantage is that compared to actual printing there would not be a paper problem with the picking list. By performing a fictive printing first and then manually or automatically having the picking list printed when needed, the paper process would be more secured. The actual balance would be booked when the actual printing occur and this is the disadvantage. The risk with the fictive printing is that the stock balance may differ because of the time gap between the fictive and the actual balance booking.

![Figure 9.3 The idea with fictive printing](image)

The third developed idea with automatic printing would be to have actual printing with delay, see figure 9.4. During the Workshop it was pointed out that it is important that the stock balance would be booked off only once. One advantage with actual printing without printing the picking lists immediately is that the paper process is secured. This means that an actual printing would be done in order to book the balance and be referred to LDC-Coordinator if parts would not be available. The picking list would be printed out when needed.

![Figure 9.4 The idea with actual printing with delay](image)
Liker (2009) states that new technical solutions should be encouraged. It is important to have in mind that an automatic printing might take time to implement, which could be seen as a disadvantage. A new way of working could create problems in other parts of the process and these would have to be secured before the implementation. All three solutions of automatic printing would be possible to implement but would require resources from IT-department. The actual printing with delay are the one with most advantages but the development process could be a longer.

### 9.3.1.5 Secure update of instructions

The Benchmarking at Parker Hannifin inspired the suggestion with secure update of instructions. The suggestion secures knowledge by always having the updated information available.

As written in the current situation analysis, Volvo’s employees at CDC want to have instructions on paper and not in the computer. The reason for this could be that the instructions always have been available in paper form and it could be difficult to change this habit. New technical solutions should always be encouraged (Liker, 2009). Updates of instructions could be difficult if they are printed on paper, as there could be several editions at different departments. Online instructions together with online updates enables secure updates of instructions. Online instructions also allows a possibility to establish an alarm when new instructions are not read. This would not be possible with printed instructions.

### 9.3.1.6 Alarm and safe mode

Alarm and safe mode was an idea that was aroused during the Workshop, which would be a way to enable error-proofing when processing referrals. This could be used by not allowing other actions before the printing of referrals class 3 has been done. To use an alarm within the referral process could help the employees to be reminded of what tasks that needs to be done. These alarms could be created in different ways but the purpose would be to arouse the problem when it is occurred, so it would not be hidden. The theory for the Japanese lake supports the mind-set of the importance of taking problems up to surface (Liker, 2009).

Another idea about how to use alarm for securing correct printing was by having an extra resource together with an alarm system. Information was gained during the current situation analysis that one department has started with having an extra employee available. This employee worked as an extra resource when it was stressful. The work with referrals is different for each day and stress was told to be one of the common reasons for mistakes during the interviews with employees at CDC. An extra resource could be used together with an alarm system. When workload would increase an extra resource could be called in to support. This is a solution that would reduce the workload and prevent mistakes due to stress in the work environment. The solution would need an appropriate way of “alarming” when needed. If the idea with
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an extra resource would be implemented it is important that this extra recourse would not wait to be alarmed but to have other tasks in-between.

9.3.2 Knowledge regarding referrals

It is of importance to understand referrals class 3 and the differences in the process for each market. The current situation analysis revealed some gaps between the actual process and the employees’ knowledge of the process. Therefore analysis and discussion are presented in this section regarding which information that should be spread out, in which way and how the knowledge about the referrals could be secured.

9.3.2.1 Which information?

The idea *same information to everybody* arouse in the current situation analysis along with the idea *information regarding “why”*. An idea that also could be linked to these was *information regarding the referral process* that was generated through the Workshop. This study has resulted in information material including what referrals are and its process, but also when things need to be done and why. It is of importance to not only spread the knowledge what, when and where but also why. The way the information is processes is important according to Foster (2008). He also states that understanding the information that is studied, rather than just learning it, usually improves the memory. This is an approach Volvo have been using to explain why the organisational change is being done through information packages. In the produced material, which can be seen as education material, there have been emphasise on why some things are important. In order for employees to perform the very best at their job it is important they understand why it needs to be done. Not understanding the purpose of a task could lead to an incorrectly performance.

Throughout the study it has been noticed that some employees did not understand the LDC-concept and therefore started to think about making changes within their work. This could lead to sub-optimisation and affect the overall referral flow negatively. It is positive that employees would like to make their workplace better but changes should not be done if there is a limited understanding of the consequences. It is important to understand why things are done in a certain way. It is of importance to understand the LDC-concept, the referral process and the LDCs. To spread information regarding this subject was also ideas generated through current situation analysis and the Workshop.

9.3.2.2 How to gain information

There are several ways on how to spread knowledge of the referral service. Because of the ongoing organisational change it is of importance that all new article areas start working in the same way. Instructions aroused as a tool on how to gain information during the Workshop. From interviews in the current situation analysis emphasis was also on practical experience through training by help from an employee. It was stated
that some employees would like to learn different tasks through practical experience and to have instructions as a back-up.

In the quotation in the section for referrals a warehouse employee made a statement. He stated that it would have been good if the people that are working with orders to the Local Distribution Centre, LDC, actually visited one. This in order to gain a higher understanding of why some things are done and the consequences if some things would have been changed and how it affect the next step in the process. To let all relevant employees make a field trip to where they send their orders could encourage them to perform even better at their jobs and to make good improvements. It could be expensive to send all employees to different LDCs around Europe, but it could be worth it in the long run. An alternative would be to visit the LDC in Gothenburg that is located in the same premises. This would not be as expensive and time consuming as visits around Europe.

9.3.2.3 Referral group

There was an idea during the Workshop regarding that a special group would process referrals. The group would pick spare parts in the entire warehouse for referrals.

To keep the work with referrals isolated from other orders would be one way to easier secure the work and to assure knowledge would be maintained regarding referrals. The employees that would work with referrals would be familiar with the referral process and the way of working. There would probably be a higher cost to have this extra group instead of in the normal flow. Today Volvo has not calculated what the cost is for a referral that is not delivered Just-In-Time. Therefore it is difficult to justify this separate flow. To use statistics, as the benchmarked company does, could be a way to see if this separate flow could be profitable.

A disadvantage with a separate referral group is that it contradicts with the purpose of CDC-ABC. It is important to understand the ongoing organisational change and the size of CDC. The referral group could be seen as a not standardised way of working, which is a big part of the change. If a department would like to modify the ongoing organisational change there might be other departments in CDC that also would like to change. This could cause disagreements that would not be good for the future of CDC-ABC.

9.3.3 Continuous improvements

Continuous improvements are according to Liker (2009) a corner stone of Lean Production and a principle for learning. Below are ideas that aroused from the current situation analysis, data collection, Benchmarking and Workshop analysed and discussed. These ideas are suitable to continuously work with.
9.3.3.1 Reduction of waste

Referrals could be seen as a waste because they occur when the orders were not available in LDC. The most optimal way to work with pre-planned orders would be if there only would be refill orders and no referrals. This would be the optimal way because it is faster and easier to pick refill orders rather than referrals.

A suggestion that arose during the Workshop was to have the correct product range both in LDC and CDC, this would reduce the number of referrals. This could be seen as a way to work with the root cause, which is to work with continuous improvements. The correct product range would not be 100 percent availability because it would tie up large stocks according to Axelsson & Agnal (2012). The Purchase Planners and the Inventory Coordinators could together determine the correct range by investigation of the needed amount for each spare part in each LDC. This collaboration could reduce the number of orders lines that would not be available in LDC and thereby reduce the number of referrals. The world is constantly changing (Monhanty & Yadav, 1996). To go through all spare parts for all LDCs would be a time consuming job and the correct product range might have changed before the work is done.

An idea that arose during the Benchmarking was to distribute all orders directly from CDC to dealers rather than from LDCs. This would benefit the availability in the distribution centre and the number of spare parts in stock because it would only be one warehouse with storage (Oskarsson et al. 2013). The storage at each dealer would however increase because the location of the storage would be further away for most dealers. The LDC-concept means that the dealer should decrease their storage and instead rely on fast Just-In-Time deliveries from the connected LDCs. Therefore, the suggestion contradicts with the LDC-concept.

9.3.3.2 Optimise pending order

Another way to reduce the number of referrals would be to have an optimised use of pending orders for markets with pending order system.

The benefit of having an order pending a longer time in LDC is that it creates bigger possibilities for having a refill from CDC to LDC delivered. An optimal use of pending orders would increase the number of refill orders rather than referrals. The work CDC puts on referrals rather than refill orders are service the LDCs are supposed to provide.

The suggestion is therefore to change the time for how long an order is pending with consequences that the referrals would be visible fewer days in CDC, see table 9.2. The suggestion requires though that the referrals would be printed in the morning on the visible day before 7.00 hours. The morning printing is done in order to maintain the time for the LDC-coordinator to provide service. The German market could not decrease the visible days in CDC to 2 days although the lead time is the same as for
Sweden and Norway. The reason for three days is because dangerous goods need to be announced one day before shipping.

Table 9.2 Analysis of the possibility to optimise pending order

<table>
<thead>
<tr>
<th>Market</th>
<th>Pending order system</th>
<th>Days visible in CDC</th>
<th>Possible to improve</th>
<th>Suggestion: Pending until CDC have this visible days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>Yes</td>
<td>3</td>
<td>Yes</td>
<td>2</td>
</tr>
<tr>
<td>Norway</td>
<td>Yes</td>
<td>3</td>
<td>Yes</td>
<td>2</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>Yes</td>
<td>3</td>
<td>No</td>
<td>-</td>
</tr>
<tr>
<td>Germany</td>
<td>Yes</td>
<td>4</td>
<td>Yes</td>
<td>3</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>No</td>
<td>4</td>
<td>N/A</td>
<td>-</td>
</tr>
<tr>
<td>Belgium</td>
<td>No</td>
<td>4</td>
<td>N/A</td>
<td>-</td>
</tr>
<tr>
<td>Italy</td>
<td>No</td>
<td>5</td>
<td>N/A</td>
<td>-</td>
</tr>
<tr>
<td>Switzerland</td>
<td>No</td>
<td>5</td>
<td>N/A</td>
<td>-</td>
</tr>
</tbody>
</table>

CDC’s referral service and the LDC-Coordinator is an important service in order to gain a higher availability. However, referrals could theoretical be seen as a waste which could be optimised in the LDC-concept. Therefore it could be a suggestion to keep working with continuous improvement like optimising the pending orders.

9.3.3.3 Visualise problem and improve

The Benchmarking at the company Parker Hannifin contributed ideas about visualising the problems and to use improvement tools for when problem occur. In order to work with continuous improvements it is important to visualise and work with the problems. To use an improvement tool when problem occur would be a way to standardise the process of working with problems and to secure that it would not happen again. Visualisation of problems could be beneficial because it could be easier to understand the problem from a holistic point (Tonnquist, 2014).

9.3.3.4 Collect and analyse statistics

An aroused idea for enabling continuous improvements was to collect and analyse statistics. The inspiration came from the Benchmarking at Parker Hannifin, which are using statistics in order to improve their processes.

It is according to Magnusson et al. (2003) important that a company use tools and routines for selection of projects. They also state that two typical criteria to consider are cost saving potential and the impact on customer satisfaction. There are no statistics on how many referrals that are delivered incorrectly and therefore no cost of the problem. The non-use of statistics could make it difficult to justify why some
improvement projects should start. It could also be hard to have an overview of what the problem actually is. To collect data for statistics are a waste if it is not used. It is therefore important to collect relevant data and to use it for continuous improvements. It is also important to involve the employees that are compiling the statistics for the improvement, to make them feel that it is meaningful. An automatic collection and compilation would also be good, as technical solutions should be encouraged (Liker, 2009).

### 9.4 Spread the knowledge

This section will analyse and discuss the spreading of knowledge of referral service with the people that is working in the referral line of production. The analysis and discussion will involve Workshop as a way of exchanging knowledge and presentation of the study’s result as another way to spread the knowledge.

#### 9.4.1 Workshop as a way of exchanging knowledge

The performed Workshop was a way to work together and exchange knowledge regarding the problems in the referral flow in CDC. The Workshop was therefore a method used for spreading knowledge between different departments.

While performing the study it was noticed that there were some barriers between different departments. One reason for this might be that some department does not meet frequently for discussions and it could therefore be more difficult to understand each other. One way to reduce the gap of information and understanding for referrals was the Workshop. Different departments received the same information at the Workshop regarding the referral flow and thereafter could have discussions.

One of Deming’s 14 points for management is according to Bergman & Klefsjö (2010) to break down barriers between staff areas. Several representatives from different department attended the Workshop for this study, which was also used as a way to break potential barriers that may have existed between the departments. It is easier to cooperate and make improvements if the employees from different departments speak the same language and tries to understand different perspective of the problem. The method of using Workshop could be further used to solve and prevent problems together.

#### 9.4.2 Use of the result

The result of this study includes information material and proposals, which has been spread to everyone involved in the process. This was also an idea that aroused during the current situation analysis. The informational material could be seen as a base in order to have right conditions for managing the Just-In-Time deliveries after the organisational change, with focus on referrals class 3. The conditions may change regarding the process or market and therefore it is important to continuously having the information updated.
The information material could be a base for the article areas to create their own standards, which is important that they develop themselves (Liker, 2009). Thereby the working approach would be adapted to the conditions that are applied for securing the referral service. The employees that are working with referrals have the detailed knowledge regarding their area and to hand out a way of working would not have been accepted. The information material therefore explains what must be done, when and why. The material will work as a base that needs to be taken into consideration in order to gain a standardised way of working.

The presentation of this material was a way to spread the knowledge to several different departments in CDC. The intentions of spreading the knowledge about referrals could be met through representatives from different departments during the presentation. A reason for inviting several people within management was that it is of importance that leaders are following the philosophy. In this case the philosophy includes understanding the LDC-concept, referrals service and the conditions needed to deliver Just-In-Time. Liker (2009) states that leaders should follow the philosophy and also work with spreading it further to their employees. Brilliant individuals and teams should be taught to work according to the company’s philosophy in order to obtain good results (Ibid).

10 Suggestions

Suggestions for future work regarding how to secure and improve the referral flow will be presented in this chapter. Several of the analysed ideas could be valuable to implement but would need further evaluation to establish profitability. Due to the lack of statistics regarding the cost of the problem it is difficult to establish which solutions are profitable to implement. Therefore, all ideas will not be suggested for future work in this chapter because they would need to be investigated further.

The suggested solutions in this chapter are however based on the advantages of solving the associated problem compared to the needed resources. The presented suggestions are divided into short- and long-term suggestions based on if the solutions possibly could be implemented within a time of six months or longer.

10.1 Short term suggestions

The first short term suggestion is to use the information material, update the material and develop working standards in CDC. The material supports employees to know how to print referrals and why, which are important in order to remember and perform right (Foster, 2008). The suggestion does not require significant resources for implementation but a consistency in updates because new LDCs are implemented continuously in Europe. Employees in the referral flow should develop working standards that are required for a reliable process, where
improvements could be applied (Liker, 2009). Standardised time for printing of referrals class 3 for all markets is to reconsider.

The second short term suggestion is to establish CDC’s RFS-date and have a limited view in the production channels. Only referrals that should be printed should be visible to reduce the risk of printing referrals with an incorrect RFS-date. Since the suggestion was accepted during the Workshop and simplifies to do right in the printing procedure it could be a well worth investment. The suggestion requires IT to develop the functionality in the system, which needs to be adjusted for each market. Part of the needed data is collected in this study and may be further used.

10.2 Long term suggestions

The first long term suggestion is automatic printing for securing that printing of referral class 3 will be done in a correct way. This eliminates the problem of printing in the morning or in the evening along with the human factor to do wrong. Quality is thereby built in the process. An actual automatic printing with delay would be preferred to simplify the process around it and would reduce the workload. Implementation requires resources and could take time to develop in order to secure the process (Liker, 2009). Technical solutions require longer implementation time and challenge the norms. However, an automatic printing could be an important improvement with consideration to an increased number of LDCs in the future.

The second long term suggestion is to review and optimise the pending order. The suggestion is to increase the pending order time for those markets that it is possible. By this, more refill orders could arrive to LDC that could lead to fewer referrals. It would be positive to strive to reduce the number of referrals since referrals could be seen as a waste (Liker, 2009). The suggested solution improves the conditions to avoid referrals to be created and thereby reduces the workload for CDC and the LDC-Coordinator. Analysis of possible markets to optimise is done and could be used for further work. The proposal works with automatic or manual printing in the morning but contradicts with manual printing in the evening.

The final long term suggestion is to gather relevant statistic and visualise problem. Relevant data should be collected regarding how often referrals are late and what consequences the problem cause and cost. Statistics helps to define possible problems and to justify project to improve them. With statistics possible proposals could be more accurate evaluated based on knowing if the solutions are worth to implement in comparison to the value of having the problem solved. Visualisation of the problems could give perspective on what does not work in the flow along with what is most important to improve. Solutions should be implemented to gain value for the overall organisation. Therefore it is important to combine the improvements with the knowledge for the process in order to avoid sub-optimisation.
11 Conclusions and future work

The study has focused on the flow of referrals class 3 and how to secure the Just-In-Time delivery for the after-market. An information material was created together with suggestions for improvements and thereby the goal is achieved. The knowledge of referrals could through the material be spread to the employees within the referral flow, but it was also spread through a performed workshop with employees from different departments.

The ongoing organisational change is not optimal for processing referrals but the change could increase the overall efficiency within the organisation. Suggestions were analysed for possible improvements on how to secure that referral service would work as promised. The proposals suggested for future work was explained in long- and short-term.

Suggestions for a short term are proposals that would do an impact on the process in order to increase the knowledge and simplify the process. One suggestion was therefore to use the created material in educational purpose and as a framework to base working standards on. A solution was also suggested on how to more concrete give correct conditions for the employees in the main warehouse, the Central Distribution Centre, by adapting the production channels.

For long-term suggestions focus has been on how to reduce the printing problem by investigate in automatic solutions, reducing referrals and to improve the use of statistics. Statistics would contribute to a base in order to justify problems and to be able to evaluate other suggestions more accurate.

For future work Volvo Car Customer Service should consider these proposals in order to secure and improve the referral service.
References


Tonnquist, Bo (2014). Projektledning. 5th. ed. Stockholm: Sanoma utbildning


A. Work Breakdown Structure

Secure the Just-in-Time delivery service

Project Management
- Project planning
  - Project plan
    - Work dividing
      - Gantt Chart
        - Arrow Plan
          - WBS
    - Gantt Chart
      - Meeting VCCS
        - Presentations
          - Report
- Communicate project
  - Hand over result
    - Meeting HV
      - Presentations
        - Report
- Justify the project
  - Compile consequences
    - Pre study
- Project Performance
  - Information search
    - Study books
      - Study articles
        - Search in database
  - Data collection
    - Collect info
      - Lead time
        - Compile data
          - Interviews
            - Interview guide
          - Mail
        - Collect info
          - employees
            - Compile data
              - Interviews
                - Interview guide
            - Benchmark
              - Compile data
                - Guided tour
                  - Interviews
                    - Interview guide
    - Final suggestion
      - Work shop
        - Perform
          - Prepare
            - Invite
    - Create draft
      - for suggestion
        - Analyse data
          - and compile
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B. Arrow Plan
C. Gantt chart

[Diagram showing a Gantt chart with phases such as Literature & Article study, Current Situation Analysis, Collect Data, Benchmarking, Develop Improvement Suggestion, Workshop, and Documentation.]
D. Interview guide – CDC Employees (Swedish version)

Introduktion

- Studenter från Högskolan Väst
- Examensarbete: säkerställa att referrals printas i tid efter organisationsförändringen
- Inspektion: för att vara säkra på att vi återger informationen på ett korrekt sätt

Frågor: Övergripande

- Kan du beskriva lite övergripande om dina arbetsuppgifter?
- Hur länge har du arbetat här?
- Kan du beskriva lite övergripande om hanteringen av referrals? Från början till slut?

Frågor: Information om referrals

- När på dagen hanteras referrals?
- Ser ni skillnad på olika referrals?
- Hur vet ni vart order ska skickas?

Frågor: Printning-aktivitet

- Printar ni referrals på RFS-dagen eller hur många dagar innan?
- Vad är anledningen till att ni printar?

Frågor: System i arbetet

- Vad använder ni för system idag?
- Hur har ni olika typer av instruktioner idag?
- Hur använder ni er av BMS under arbetets gång?

Frågor: Förändring

- Kan du dig förberedd för den nya organisationsförändringen?
- Hur skulle du vilja ha informationen när referrals ska printas och skickas?

Frågor: Övrigt

- Något annat som du vill tillägga eller som du tycker vi bör känna till när vi arbetar vidare?
- Sista frågan, är det ok att vi refererar till denna intervju med dig i vår rapport?

Appendix D:1
E. Interview guide – LDC-Coordinator (Swedish version)

Introduktion

➢ Studenter från Högskolan Väst
➢ Examensarbete: säkerställa att referrals printas i tid efter organisationsförändringen
➢ Inspelning: för att vara säkra på att vi återger informationen på ett korrekt sätt

Frågor – Först vill vi lösa några oklarheter

- Vilka marknader har hängande order?
- Hur många dagar innan syns det i PULS för olika marknader?
- Är det en fördröjning i systemet för vissa marknader?
- Är det någon fördröjning mellan CDC och dig?
- När går transporterorna från CDC?

Frågor – Referrals – Kod 90

- Hur långt innan bryttiden i CDC behöver du ha fått info om referrals för att jaga?
- Stämmer det att du behöver få referrals senast kl. 7:00:
  o 1 dag innan RFS för Sverige (Norge, Schweiz)
  o 2 dagar innan RFS för England (Tyskland, Italien, Holland) stämmer det?
- Du meddelar kunderna senast kl.12 samma dag som du senast behövt ha in referrals, stämmer det?
- Händer det att du får referrals (kod 90) till dig som är flera dagar innan senaste dag på grund av att de inte har hängande order?
- Fylls PRC kanalerna upp med övermorgondagens order automatiskt efter bryttiden (samma dag)?
- När du löst en referrals (kod 90) och ska lägga en order innan bryttid, vilket flöde hamnar den i; dagorder eller referral?

Frågor - Inför förändringen

- Vad skulle du vilja ha för information angående referrals-flödet?
- Känner du dig förberedd för den nya organisationsförändringen?

Frågor: Övrigt

- Något annat som du vill tillägga eller som du tycker vi bör känna till när vi arbetar vidare?
- Sista frågan, är det ok att vi refererar till denna intervju med dig i vår rapport
-
F. Interview guides – CDC Manager (Swedish version)

Introduktion

- Studenter från Högskolan Väst
- Examensarbete: säkerställa att referrals printas i tid efter organisationsförändringen
- Inspektion: för att vara säkra på att vi återger informationen på ett korrekt sätt

Frågor: Organisationsförändringen

- Skulle du kunna berätta om CDC-ABC?
- Vad är syftet och målet med förändringen?
  o Vad är orsaken till förändringen?
  o Hur långt har ni kommit? När beräknas ni vara klara?
  o Vad är nästa steg?
  o Hur går ni tillväga i implementeringen av förändringen?
- Ser ni några hinder/problem för att införa förändringen?
- Hur kommer de olika PRC att delas in för respektive VO?
- Vilka avdelningar kör referrals?

Frågor: Bevara kunskap

- Har ni någon tanke kring hur kunskap ska bevaras för arbetsuppgifter i varje VO?
- Hur går ni tillväga vid nyanställningar/nya arbetsuppgifter?
- Hur tänker du att ett hjälpande material för CDC kan se ut?

Frågor: Övrigt

- Något annat som du vill tillägga eller som du tycker vi bör känna till när vi arbetar vidare?
- Sista frågan, är det ok att vi refererar till denna intervju med dig i vår rapport?
G. Interview guides – Logistic Managers

Italy & Switzerland

**Introduction**

- Student from Industrial Engineering and Management, University West
- Thesis work: secure that referrals are printed in time after the organisational change
- Record the interview: To be sure we reproduce the information correctly

**Overall**

- What is your responsibility regarding LDC in Italy and Switzerland?
- Which markets do you have?

**Lead time CDC - LDC**

- Are there any exceptions regarding the different lead-time to LDC?
- If the LDCs receive referrals too early (before RFS-date) do they hold the orders until RFS-date or do they send right away to the dealer?
- How much and how often do the cut-off-times and transport times change?
- How often is the transport to Bologna late, so the transport to dealers is not met in time (kl. 13)?
- Does everything that goes to Italy go through Bologna?
- What do you mean with 80 % reliability to Bologna?
- What time does the transport leave CDC to each LDC?
- Which transports stops where on the way?

**Agreements & System**

- What is the procedure when a new LDC is created?
- Are there any different agreements for each market?
- How much do the customers influence?
- What kind of order system does Italy and Switzerland have?
- What time a day are the orders transferred from webPULS to PULS? LDC to CDC?
- What is the “problem” in Italy with pending/hanging orders?

**End topic**

- Is there anything else you would like to add or that you think we should know when we continue our work?
- Last question, is it okay if we refer to this interview with you in our report?
Germany, The Netherlands & Belgium

Introduction

- Student from Industrial Engineering and Management, University West
- Thesis work: secure that referrals are printed in time after the organisational change
- Record the interview: To be sure we reproduce the information correctly

Overall

- What is your responsibility regarding LDCs in Netherlands and Germany?
- Which markets do you have? Do you have all LDCs in Germany and Netherlands?

Lead time CDC-LDC

- What are the cut-off-times and lead-times from CDC to your markets?
- Are there any exceptions regarding the different lead times to LDC?
- How much and how often do the cut-off-times and transport times change over time?
- How many days before RFS do LDC print? They see three days early.
- If the LDCs receive referrals too early (before RFS-date) do they hold the orders until RFS-date or do they the orders send right away to the dealer?
- Which transports stops where on the way?

Agreements & System

- What is the procedure when a new LDC is created?
- Are there any different agreements for each market?
- How much do the customers influence?
- What kind of order system does Netherlands and Germany have?
- What time during the day are the orders transferred from Dealers to PULS?
- Which of your markets have hanging/pending orders?
- What time does LDC check if the hanging orders are in stock?

End Topic

- Is there anything else you would like to add or that you think we should know when we continue our work?
- Last question; is it okay if we refer to this interview with you in our report?
Securing the Just-In-Time delivery for the after-market
— Study at Volvo Car Customer Service

H. Process flow in CDC

Referral

Order from LDC Coordinator

Order to LDC Coordinator

Order dividing

Order printing

In stock balance?

Printing of picking list

Available in stock?

Picking

Packaging

Full case?

Loading

Shipping

Spare part to LDC

Available in stock?

Picking parts

Consolidation

Inventory request

Document to LDC Coordinator

Cancellation of order

Buffer check

Available in stock?

Picking

Delivery to packaging

YES

NO

NO

YES
I. Process flow in LDC
J. Compiled information (Swedish version)

Swedish version of the compiled information in Excel.

<table>
<thead>
<tr>
<th>LOKALISERING</th>
<th>SYSTEM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Land</td>
</tr>
<tr>
<td>Sweden - 778</td>
<td>LDC 1A</td>
</tr>
<tr>
<td></td>
<td>LDC 1B</td>
</tr>
<tr>
<td></td>
<td>LDC 1C</td>
</tr>
<tr>
<td></td>
<td>LDC 1E</td>
</tr>
<tr>
<td>Norway - 878</td>
<td>LDC 3J</td>
</tr>
<tr>
<td>United Kingdom - 1278</td>
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<td></td>
<td>LDC 3B</td>
</tr>
<tr>
<td>Germany - 2278</td>
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<td></td>
<td>LDC 3E</td>
</tr>
<tr>
<td></td>
<td>LDC 3G</td>
</tr>
<tr>
<td>Netherlands - 1678</td>
<td>LDC 21</td>
</tr>
<tr>
<td></td>
<td>LDC 2B</td>
</tr>
<tr>
<td>Belgium - 1258</td>
<td>LDC 21</td>
</tr>
<tr>
<td></td>
<td>LDC 22</td>
</tr>
<tr>
<td>Italy - 1822</td>
<td>LDC 3D</td>
</tr>
<tr>
<td></td>
<td>LDC 3F</td>
</tr>
<tr>
<td></td>
<td>LDC 2G</td>
</tr>
<tr>
<td>Switzerland - 2078</td>
<td>LDC 2H</td>
</tr>
<tr>
<td>Land</td>
<td>DC</td>
</tr>
<tr>
<td>------------------------</td>
<td>----</td>
</tr>
<tr>
<td>Sweden - 778</td>
<td>LDC 1A</td>
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<td></td>
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<td></td>
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<tr>
<td>Norway - 678</td>
<td>LDC 3J</td>
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<tr>
<td>United Kingdom - 1378</td>
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<td>Germany - 2278</td>
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<td>LDC 3E</td>
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<tr>
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<td>LDC 3I</td>
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<tr>
<td>Belgium - 1258</td>
<td>LDC 2J</td>
</tr>
<tr>
<td></td>
<td>LDC 3J</td>
</tr>
<tr>
<td></td>
<td>LDC 3K</td>
</tr>
<tr>
<td></td>
<td>SDC 25</td>
</tr>
<tr>
<td>Switzerland - 2078</td>
<td>LDC 3M</td>
</tr>
</tbody>
</table>
### LOKALISERING

<table>
<thead>
<tr>
<th>Land</th>
<th>DC</th>
<th>Prinna och skeppa (innan bryttid)</th>
<th>Printning för jagning</th>
<th>Ledtid mellan CDC-LDC (dagar)</th>
<th>Leverans på LDC</th>
<th>Leverans hos AF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sweden - 778</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LDC 1A</td>
<td>dag 0 - (-2)</td>
<td>(dag -3) ca 19:00</td>
<td>1</td>
<td>Natten till (dag -1)</td>
<td>&lt; 7:00 (dag 0)</td>
<td></td>
</tr>
<tr>
<td>LDC 1B</td>
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<td></td>
</tr>
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<td>LDC 1E</td>
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<td>(dag -3) ca 19:00</td>
<td>1</td>
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<td></td>
</tr>
<tr>
<td><strong>Norway - 878</strong></td>
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<td></td>
</tr>
<tr>
<td>LDC 3J</td>
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<td>(dag -3) innan bryttid</td>
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</tr>
<tr>
<td><strong>United Kingdom - 1378</strong></td>
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<td>2</td>
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<td>&lt; 7:00 (dag 0)</td>
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<tr>
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<td>2</td>
<td>07:00 (dag -1)</td>
<td>&lt; 7:00 (dag 0)</td>
<td></td>
</tr>
<tr>
<td><strong>Germany - 2278</strong></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
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<td>(dag -2) innan 07:00</td>
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</tr>
<tr>
<td>LDC 3D</td>
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<td>(dag -2) innan 07:00</td>
<td>1</td>
<td>07:30 (dag -1)</td>
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</tr>
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<td>1</td>
<td>07:30 (dag -1)</td>
<td>&lt; 7:00 (dag 0)</td>
<td></td>
</tr>
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<td>07:30 (dag -1)</td>
<td>&lt; 7:00 (dag 0)</td>
<td></td>
</tr>
<tr>
<td><strong>Netherlands - 1678</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>1</td>
<td>07:30 (dag -1)</td>
<td>&lt; 7:00 (dag 0)</td>
<td></td>
</tr>
<tr>
<td>LDC 3I</td>
<td>dag 0 - (-2)</td>
<td>(dag -2) innan 07:00</td>
<td>1</td>
<td>07:30 (dag -1)</td>
<td>&lt; 7:00 (dag 0)</td>
<td></td>
</tr>
<tr>
<td><strong>Belgium - 1258</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDC 21</td>
<td>dag 0 - (-2)</td>
<td>(dag -2) innan 07:00</td>
<td>1</td>
<td>07:30 (dag -1)</td>
<td>&lt; 7:00 (dag 0)</td>
<td></td>
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<tr>
<td>LDC XX</td>
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<td>(dag -2) innan 07:00</td>
<td>1</td>
<td>07:30 (dag -1)</td>
<td>&lt; 7:00 (dag 0)</td>
<td></td>
</tr>
<tr>
<td><strong>Italy - 1822</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LDC 3D</td>
<td>dag 0 - (-4)</td>
<td>(dag -4) innan 07:00</td>
<td>2-3</td>
<td>13:00 (dag -1)</td>
<td>&lt; 7:00 (dag 0)</td>
<td></td>
</tr>
<tr>
<td>LDC 3F</td>
<td>dag 0 - (-4)</td>
<td>(dag -4) innan 07:00</td>
<td>2-3</td>
<td>13:00 (dag -1)</td>
<td>&lt; 7:00 (dag 0)</td>
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<tr>
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<td><strong>Switzerland - 2078</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LDC 3H</td>
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<td>1</td>
<td>13:00 (dag -1)</td>
<td>&lt; 7:00 (dag 0)</td>
<td></td>
</tr>
</tbody>
</table>
## K. Rules and actions for a facilitated Workshop

<table>
<thead>
<tr>
<th>Rules</th>
<th>Planned actions to accomplish the rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear purpose with the workshop</td>
<td>• Spread the knowledge and inform</td>
</tr>
<tr>
<td></td>
<td>• Brainstorming ideas to one problem</td>
</tr>
<tr>
<td>Only participants that can contribute are invited</td>
<td>• Selected participants with experience in relevant areas for the subject</td>
</tr>
<tr>
<td></td>
<td>• Invitation with information about why they are invited</td>
</tr>
<tr>
<td>Workshop is performed according to a broad structure agenda, with some flexibility</td>
<td>• Preliminary agenda</td>
</tr>
<tr>
<td></td>
<td>• Estimated time for each activity</td>
</tr>
<tr>
<td></td>
<td>• List of possible scenarios and how to handle them</td>
</tr>
<tr>
<td>The workshop sessions aims for the outcomes and the outcomes are noted</td>
<td>• Brainstorm for ideas/solutions</td>
</tr>
<tr>
<td></td>
<td>• Ideas on Post-It</td>
</tr>
<tr>
<td></td>
<td>• Post-It on Ishikawa-diagram</td>
</tr>
<tr>
<td></td>
<td>• Individual ranking</td>
</tr>
<tr>
<td></td>
<td>• Pros/Cons are noted on flipchart</td>
</tr>
<tr>
<td></td>
<td>• Photographs to document</td>
</tr>
<tr>
<td>All participants should be included</td>
<td>• Own Post-its and pens for each participant</td>
</tr>
<tr>
<td></td>
<td>• All participant present their own ideas in rotation</td>
</tr>
<tr>
<td>Participants are stimulated and encouraged to contribute</td>
<td>• Brainstorming sessions</td>
</tr>
<tr>
<td></td>
<td>• Individual ranking</td>
</tr>
<tr>
<td></td>
<td>• Discussions</td>
</tr>
<tr>
<td></td>
<td>• Each activity lasts for maximum 15 minutes</td>
</tr>
<tr>
<td></td>
<td>• Coffee and snacks are available</td>
</tr>
<tr>
<td>Participant should listen and try to understand each other’s views</td>
<td>• Inform in the beginning of the workshop about the code of conduct.</td>
</tr>
<tr>
<td></td>
<td>• Presentation of ideas is done without interrupting or negative tone.</td>
</tr>
<tr>
<td>The facilitator are well informed, but unbiased</td>
<td>• Weeks of study within the area</td>
</tr>
<tr>
<td></td>
<td>• Facilitator are aware of their role during the workshop and how to handle situations</td>
</tr>
<tr>
<td>Workshop is a part of a larger process</td>
<td>• Workshop is used as method for accomplishing part of the project goal.</td>
</tr>
</tbody>
</table>

Source: The rules are interpreted from Cameron (2005), p. 2.
Stort tack för allas deltagande igård!
Här kommer en sammanställning av Workshopen som utlovat. Materialet ur denna workshop kommer användas och analyseras vidare i vårt examensarbete. Om det finns några frågor gällande innehållet i denna sammanställning är ni välkomna att skicka ett e-mail med era funderingar till oss. Examensarbetet i sin helhet kommer att redovisats på Volvo framöver och ni som är intresserade är hjärtligt välkomna då!

Workshopen hölls den 26/2 kl.16:15 – kl.17:30 i konferenslokalen Lissabon på Orderkontoret för Europa. Det var sju deltagare på workshopen:

- **Deltagare 1** Lagermedarbetare
- **Deltagare 2** Group Manager
- **Deltagare 3** Lagermedarbetare
- **Deltagare 4** Manager CDC
- **Deltagare 5** Business Application Manager
- **Deltagare 6** LDC-Koordinator
- **Deltagare 7** Regional Logistic Manager

Workshopen var en del av vårt examensarbete, där syftet är att säkerställa Just-In-Time leveranser för eftermarknaden.

Målet med gårdagens workshop var därför att samla idéer för hur man kan säkerställa att referrals (klass 3) kommer i rätt tid till LDC-Koordinator. Anledningen till detta mål är för att LDC-konceptet ska fungera som lovat mot kunderna, det vill säga att förplanerade order ska komma i tid till kond även om de saknas i CDC.

Först kickades workshopen igård med presentation av hur referrals processen ser ut idag och problematiken och dess frågeställning: Hur kan man säkerställa att referrals kommer i rätt tid till LDC-Koordinator?


Efter en kort men intensiv workshop togs många bra idéer fram och resultatet ser ni sammanfattat i slutet. Om någon är intresserad av att tillägga några tankar eller synpunkter på workshopen, på idéerna eller på problemet är ni välkomna att höra av er till oss. Återigen, stort tack för engagemanget!
Securing the Just-In-Time delivery for the after-market — Study at Volvo Car Customer Service

FISKBENS DIAGRAM: Idéer för hur man kan säkerställa att referrals (klass3) ska komma i tid till LDC-koordinator

METOD

Olika RFS för olika marknader -> Samma

Printas på kvällen i de fall det går

Rätt sortiment på LDC på populära artiklar

MASKIN

Automatisk faktisk printing

Fiktiv printing/IT-lösning

Auto printing till separat printer

Smartare PULS

Färre olika brytningar

Systemlarm, ej utskriven order

Felsäkert läge

Utskrift hos LDC-Koordinator, hämtas där

Inriktta LDC-RFS

Endast order med rätt RFS på PRC-kö

Funktion utskrift igen

MÄNNISKA

Kunnig personal

Bra kontakt med LDCer

Information till alla grupper om konceptet

Även andra grupper är insatta i referrals

LDC förplanerade referral hanteras av speciell grupp

Material

MILJÖ

Egen referrals/VOR

Avdelning

Anskaffning + Lagerstyrare <= 3

MANAGEMENT

Appendix
RANKNING

Inför rankning av idé-förslagen genomfördes fick varje deltagare tre klisterlappar (två blå och en röd) att placera på de alternativen som de trodde mest på. Klisterlappen som var röd skulle placeras på idéen som var deras första hands val.

Efter rankningen hade dessa idéer fått högst rankning:

<table>
<thead>
<tr>
<th>Totalt (andel röda)</th>
<th>Rankning</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 (4)</td>
<td>Fiktiv printning/IT-lösning</td>
</tr>
<tr>
<td>4 (2)</td>
<td>Inrätta CDC RFS</td>
</tr>
<tr>
<td>2 (1)</td>
<td>LDC förplanerade referral hanteras av speciell grupp</td>
</tr>
<tr>
<td>2</td>
<td>Automatisk faktisk printning</td>
</tr>
<tr>
<td>2</td>
<td>Smartare PULS</td>
</tr>
<tr>
<td>2</td>
<td>Kunnig personal</td>
</tr>
<tr>
<td>1</td>
<td>Auto printning till separat printer</td>
</tr>
</tbody>
</table>

Här har vi satt ihop idéen Fiktiv printning med IT-lösning då det visade sig under diskussionen att deltagare var eniga om att det var tänkt som samma sak.
**SAMMANFATTNING AV DISKUSSION: FÖRDELAR OCH NACKDELAR**

<table>
<thead>
<tr>
<th>Fiktiv printning/IT-lösning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fördelar</strong></td>
</tr>
<tr>
<td>Inga papper</td>
</tr>
<tr>
<td>Information direkt</td>
</tr>
<tr>
<td>Inget behov av att säkra kompetens</td>
</tr>
<tr>
<td>Resurseffektivt</td>
</tr>
</tbody>
</table>

| **Nackdelar**                |
| Missa printning              |
| Försvunnen artikel - klass 1 kan ta plats |

*Viktigt att boka av mot saldo så att det som sägs finnas faktiskt finns*

<table>
<thead>
<tr>
<th>Inrätta CDC RFS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fördelar</strong></td>
</tr>
<tr>
<td>Inte räkna</td>
</tr>
<tr>
<td>Överskådligt</td>
</tr>
<tr>
<td>Bättre förutsättningar</td>
</tr>
</tbody>
</table>

| **Nackdelar**                |
| Mycket papper pga mer order |
| (inte bara förplanerade vid printning) |
| Två olika RFS på kollflagga → risk för fel |

<table>
<thead>
<tr>
<th>LDC förplanerade referral hanteras av speciell grupp</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fördelar</strong></td>
</tr>
<tr>
<td>Uppdaterad kunskap</td>
</tr>
<tr>
<td>Lättare att hålla koll</td>
</tr>
<tr>
<td>Ingen konsolidering</td>
</tr>
</tbody>
</table>

| **Nackdelar**                                          |
| Fler människor pga längre sträcka                     |

<table>
<thead>
<tr>
<th>Automatisk faktisk printning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fördelar</strong></td>
</tr>
<tr>
<td>Behöver inte tänka på printning</td>
</tr>
<tr>
<td>Allt printas i tid</td>
</tr>
</tbody>
</table>

| **Nackdelar**                                          |
| Papper kan försvinna                                  |
Securing the Just-In-Time delivery for the after-market  
— Study at Volvo Car Customer Service

### M. Ideas from Workshop

<table>
<thead>
<tr>
<th>Total (number of red)</th>
<th>Ideas</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 (4)</td>
<td>Fictive printing/IT-solution</td>
</tr>
<tr>
<td>4 (2)</td>
<td>Establish CDC’s RFS</td>
</tr>
<tr>
<td>2 (1)</td>
<td>LDC pre-planned order is processed by a special group</td>
</tr>
<tr>
<td></td>
<td>Automatic actual printing</td>
</tr>
<tr>
<td></td>
<td>A smarter PULS</td>
</tr>
<tr>
<td></td>
<td>Competent staff</td>
</tr>
<tr>
<td></td>
<td>Automatic printing to a separate printer</td>
</tr>
<tr>
<td></td>
<td>Different RFS-date for different markets → same</td>
</tr>
<tr>
<td></td>
<td>Printing in the evening (for hunting)</td>
</tr>
<tr>
<td></td>
<td>Routines and standards</td>
</tr>
<tr>
<td></td>
<td>Clear instruction: market, time, date, who, when, how</td>
</tr>
<tr>
<td></td>
<td>System alarm, not printed order</td>
</tr>
<tr>
<td></td>
<td>Safe mode</td>
</tr>
<tr>
<td></td>
<td>Fewer different cut-off-times</td>
</tr>
<tr>
<td></td>
<td>Only order with correct RFS-date in PRC-queue</td>
</tr>
<tr>
<td></td>
<td>Function: print again</td>
</tr>
<tr>
<td></td>
<td>Printing LDC-Coordinator, collect there</td>
</tr>
<tr>
<td></td>
<td>Printing group manager, hand out at start-up</td>
</tr>
<tr>
<td></td>
<td>Information to all groups regarding the LDC-concept</td>
</tr>
<tr>
<td></td>
<td>Good contact with LDCs</td>
</tr>
<tr>
<td></td>
<td>Organisation: own referrals/VOR section</td>
</tr>
<tr>
<td></td>
<td>Other groups are familiar with referrals</td>
</tr>
<tr>
<td></td>
<td>Purchase planners + inventory coordinators = True</td>
</tr>
<tr>
<td></td>
<td>Correct product range for top spare parts at LDC</td>
</tr>
</tbody>
</table>
N. Advantages and disadvantages with discussed ideas during Workshop

Table 1 Advantages and disadvantages of Fictive printing/IT-solution

<table>
<thead>
<tr>
<th>Fictive printing/IT-solution</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advantages</td>
<td>No papers</td>
<td>May miss to print</td>
</tr>
<tr>
<td>Direct information</td>
<td>Direct information</td>
<td>Spare part not available when print – Class 1 may go before</td>
</tr>
<tr>
<td>No need to secure competence</td>
<td>Resource efficient</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 Advantages and disadvantages of Establish CDC’s RFS

<table>
<thead>
<tr>
<th>Establish CDC’s RFS</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advantages</td>
<td>Do not need to count</td>
<td>More papers due to more orders – Not only pre-planned order when printing</td>
</tr>
<tr>
<td>Will be an overview</td>
<td>Better conditions</td>
<td>Two different RFS on the flag</td>
</tr>
</tbody>
</table>

Table 3 Advantages and disadvantages of LDC pre-planned referrals processed by a special group

<table>
<thead>
<tr>
<th>LDC pre-planned referrals processed by a special group</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge will be up to date</td>
<td>Knowledge will be up to date</td>
<td>More staff due to longer distances</td>
</tr>
<tr>
<td>Easier to keep track</td>
<td>Easier to keep track</td>
<td></td>
</tr>
<tr>
<td>No consolidation</td>
<td>No consolidation</td>
<td></td>
</tr>
</tbody>
</table>

Table 3 Advantages and disadvantages of Automatic actual printing

<table>
<thead>
<tr>
<th>Automatic actual printing</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advantages</td>
<td>No need to think about printing</td>
<td>Papers may disappear</td>
</tr>
<tr>
<td>Everything is printed in time</td>
<td>Everything is printed in time</td>
<td></td>
</tr>
</tbody>
</table>