DEVELOPING REVERSE LOGISTICS

Case: Developing return and reuse process in case organization

LAHTI UNIVERSITY OF APPLIED SCIENCES
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Suvi Seppälä

Lahti University of Applied Sciences
Faculty of Business Studies

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ABSTRACT

In this Master's Thesis reverse logistics theory is studied and applied into practice in the case study. The case study consists of developing the case organization's return and reuse process.

In short, reverse logistics is a process of moving goods, money and information goods from their typical destination to some other point in efficient, cost effective and timely manner and at the same time recapturing value. The theoretical framework covered reverse logistic process, inventory and information management, performance measuring and financial impacts of reverse logistics. The purpose of the theoretical framework was to support the case study, thus, theory was covered from that perspective.

The empirical part of this thesis consists of developing the return and reuse process in the case organization. The target was to develop an efficient and cost-effective return and reuse process. The purpose was to address the obstacles faced in the daily work and at the same time drive for efficiency. The case study included defining the problems, root cause analysis, development and implementation of solutions, and evaluation. The data was retrieved by group and individual interviews, participant observation and studying literature. In the case study the researcher acted as the problem owner and the team members participated actively.

Due to accomplished changes, the return and reuse process is now effective and smooth. Fast decision making, prioritizing, process simplification, increased transparency, improved co-operation and awareness, and deeper understanding have been accomplished during the development. In the case organization an optimal reverse logistics process, when the items cannot be returned to the original vendor, is that the items are reused in original shape, meaning in unopened boxes, to the new customer orders within six months from return. In future, development is needed to combine approval processes, enable the system to support the return and reuse process, accomplish deeper co-operation within the company and continue negotiations with vendors.

Key words: reverse logistics, process development, return and reuse process, 8D

Lahden ammattikorkeakoulu
Liiketalouden laitos

SEPPÄLÄ, SUVI: Palautuslogistiikan kehittämien
Case: Palautus- ja uudelleenkäyttöprosessin kehittäminen kohdeorganisaatiossa

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TIIVISTELMÄ

Tämä ylemmän ammattikorkeakoulun opinnäytetyö käsittelee palautuslogistiikkaa teoriassa soveltaen sitä käytäntöön kohdeorganisaation palautus- ja uudelleenkäyttöprosessia kehitettäessä.

Lyhyesti palautuslogistiikka on prosessi, jossa tuotteita, rahaa ja informaatiota liikutetaan niille tyypillisestä päämäärästä toiseen päämäärään tehokkaasti, kustannustehokkaasti ja oikea-aikaisesti samalla ottaen talteen niiden arvoa. Teoriaosassa käsitellään: palautuslogistiikkaprosessia, inventaarion ja informaation hallintaa, performanssin ja palautuslogistiikan taloudellisten vaikutusten mittausta. Käsitellyn teorian tarkoituksena on tukea kohdeorganisaatiossa tehtävää kehitystyötä.

Opinnäytetyön empiria osuus koostuu palautus- ja uudelleenkäyttöprosessin kehittämisestä kohdeorganisaatiossa. Tavoitteena oli kehittää tehokasti toimiva ja kustannustehokas palautus- ja uudelleenkäyttöprosessi. Tarkoituksena oli keskittyä ratkaisemaan päivittäisessä työssä kohdattavia ongelmia ja samalla pyrkiä prosessin kokonaisvaltaiseen tehokkuuteen. Kohdeorganisaatiossa tehty kehitystyö sisälsi: ongelmien määrittelyn; analysoinnin; ratkaisujen kehittämisen ja toteutuksen sekä arvioinnin. Tutkimustieto kerättiin ryhmä- ja yksilöhaastatteluiden, osallistuvan havainnoinnin ja lähdekirjallisuuden avulla. Kehitystyössä tutkija toimi prosessi-koordinaattorina ja kehitystiiminjäsenet osallistuivat aktiivisesti kehitystyöhön.

Saavutettujen muutosten ansiosta palautus- ja uudelleenkäyttöprosessi on nyt tehokas ja sujuva. Nopea päätöksenteko, priorisointi, prosessin yksinkertaistaminen, kasvanut läpinäkyvyys, parantunut yhteistyö ja tietoisuus sekä syvempi ymmärrys on saavutettu. Kohdeorganisaatiossa optimaalinen palautusprosessi on, jos tuotteita ei voida palauttaa alkuperäiselle toimittajalle, että tuotteet uudelleenkäytettään uusille asiakastilauksille kuuden kuukauden kuluessa palautuksesta. Tulevaisuudessa päällekkäisiä hyväksyntä prosesseja tulee yhdistää, systeemi tulee kehittää tukemaan palautus- ja uudelleenkäyttöprosessia, vieläkin syvempää yhteistyötä tulee kehittää ja palautusehdoista tulee neuvotella toimittajien kanssa.

Avainsanat: palautuslogistiikka, prosessikehitys, palautus- ja uudelleenkäyttöprosessi, 8D

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LIST OF KEY TERMINOLOGY AND DEFINITIONS:

Organization	Organization, also called case organization, refers to the organization where the empirical case study is performed. Case organization is part of the case company's logistics operations.
Customer	The customer, also called customer team, refers to the customer of the organizations. The customer team is usually country organization of the case company. The customer team does business with the end customers which are telecommunication operators.
Reverse logistics	Reverse logistics is a process of moving goods, money and information goods from their typical destination to some other point in efficient, cost effective and timely manner and at the same time recapturing value.
Return process	Return process refers to the process that starts when the customer team addresses a return request to the case organization. To qualify for the return process items must be in original unopened boxes, thus in original shape. Return process ends when the items are moved to buffer or the items are scrapped.
Reuse process	Reuse process refers to the use of item, which are in original shape, from buffer to a new customer order. Reuse process determines how the items are disposed, like, sold to another customer, sold to a broker or scrapped. Reuse does not mean recycling of the items.
OEM hardware	OEM is abbreviation for original equipment manufacturer. Hardware (HW) items are made by customizing basic parts supplied by others. Hardware is physical equipment, such as racks and servers, used in telecommunication systems. OEM hardware (and OEM physical software and software integrated to hardware) is network equipment purchased from the third party vendor. The typical characteristic of the items is complicated product configuration

1 INTRODUCTION

This thesis will introduce the reverse logistics theory and apply it to practice in the case study. In this chapter, first background and motivation for this thesis is presented. Secondly, the research questions, objectives and limitations are defined. Thirdly, the theoretical framework of reverse logistics is shortly introduced and the key terminology is presented. Fourthly, the research methodology is introduced briefly. Finally in this chapter, the structure of the thesis is concluded.

1.1 Background for the thesis

The case company is a global telecommunication network solutions and equipment provider. It is one of the largest companies in its field with revenues exceeding 17 billion euros in 2009. The company's customers are communication service providers and the mission of the company is to help communication service provides to build more valuable customer relationships. The case company's strategy is to put the customer first. With the focus on customer case company drives strongly for efficiency. Improving delivery performance by simplification of processes and fast decision making is the strategic target of logistics operations of the case company. With the customer in mind logistics operations achieves the target by prioritizing, focusing on activities that add value and collaborating with other units.

The empirical part of this thesis has been conducted in the case organization. The case organization is one part of the case company; more specifically the case organization is part of the logistics operations of the case company. The case organization is responsible for receiving orders, purchasing from third party vendors, related logistics activities and management of the supply chain, also reverse logistics. The case organization is responsible for the complex and global supply chain. Thus, there are many global third party vendors and customer teams involved.

The pull supply chain is in use and the case organization purchases and delivers items only against the customer teams' orders. In this thesis the customer team refers to a customer of the case organization. The customer team is usually a country organization of the case company. End customer refers to communication service providers, which usually are telecommunication operators. Thus, there is a difference between customer team and end customer. The items in the orders are so called OEM (Original Equipment Manufacturer) products, meaning hardware, software and service, purchased from the third party vendor. Hardware is physical network equipment, such as racks and servers, used in telecommunication systems. The characteristic of the items is complex configurations. Configuration refers to the way items of a network are connected to make up a system.

The demand in the case organization has generated the idea for this thesis. Return and reuse processes must be developed in order to save costs and effort. There are several driving forces for this thesis and development of return and reuse process: case company's strategy includes driving for efficiency; changes in the environment generating interest in inventory management; internal needs of the case organization. In the following the case organization's internal issues and external factors are increasing the pressure to develop the return and reuse process are described.

A structured return process was defined in detail to the case organization in the fall 2008. Return process refers to the process that starts when the customer team addresses a return request to the case organization. The case organization first seeks for the possibility to return the items to the 3rd party vendor. If this is not possible, then the case organization seeks for evaluation on the reuse possibilities. Depending on the evaluation on the reuse possibilities the process ends when the items are moved to buffer or the items are scrapped. Reuse process refers to the use of the items from buffer to a new customer order. The pain points of the current process are now known to the key persons of the process, thus, it is time to develop the process.

The pressure in the case organization is extremely high. The case organization's business is booming despite the overall economical situation. In the third quarter of 2009 total value of purchased items was 150 % higher in the case organization than in Q3 2009 (Buyer 2009). More resources are difficult to obtain to the case organization, because of the company's overall financial situation. In Q3 2009 case company's net sales went down 21% year on year.

The financial crisis has forced the case company to start to monitor closely the inventory values and work to decrease the values. In January 2009, the management announced the company's objectives and one of the objectives is to decrease inventories. Since then inventory values are monitored even more closely every month. The return and reuse process has an effect on the values. Company is increasingly interested in reverse supply chains for economic reasons.

The reasons why a return process is needed are well valid. The way of doing business is affected by the financial crisis. The case company has the following process in use, called a risk ordering process. Even though the customer team does not have a contract yet with the end customer, they are able to start the ordering process, if they have management approvals. Lead time of the OEM items can be relatively long and the purchasing from the third party vendor has to be done, so that the delivery date determined by the end customer can be met. Since risk order process is in use, it is realistic to expect that the 'risk' might occur, meaning the business deal fails with the end customer and we have received the items from the vendor. As a result of this, the return process will start. In September 2009, 28% of the items were ordered under risk order title (Business Analyst 2009).

Another reason for returns is incorrect orders. The products are complicated and it is difficult for the customer teams to master the ordering. Also many of the customer teams are shifting to a new ordering system and the competence to use the system is not adequate. The lack of competence regarding these two issues is causing that customer teams are ordering wrong items. From October 2008 to September 2009 in

average 42 % of the orders were incomplete or incorrectly placed by the customer team (Order Engineering Logistics Manager 2009). In some, not in all, of these cases the error is not noticed in time and the customer team will receive items that they have ordered, but not really need. When customer teams notice the error, they try to return the unwanted items.

To sum up the motivation for this thesis, the need of return and reuse process development arises from the obstacles tackled in the daily work. These obstacles are caused by internal and external factors affecting the process. The process development has also a close connection with the strategy of the case company; drive for efficiency with the customer first in mind. Process simplification, fast decision making, prioritizing, co-operation within the company and importance of inventory management are aspects of the case company's strategy, thus, aspects of this thesis.

1.2 Research questions, objectives and limitations

The target of this thesis is an efficient return and reuse process, which would minimize the overall costs. The main purpose of this thesis is to develop the return and reuse process of the case organization. The main focus is in finding effective ways to handle the items in return and reuse process. First, a clear vision is needed of what should be done to the items in the process. Then a strategy needs to be defined about how the desired flow of the items and end result is achieved. Instructions are needed to be created to ensure the effective process in different circumstances and to guide the participants. The process is made more efficient by setting a certain time frame for some of the actions. The monitoring of the process ensures the development is in line with the vision. The instructions will determine what is done to the items in return and reuse process in practice and ensure that the desired vision is followed. This thesis focuses on the return and reuse process to work effectively in practice. The importance of the process to work in practice can not be over emphasized. The

performances and actions related to return and reuse process are to be value adding and working effectively in real life.

The research question for this thesis is: What is the optimal reverse logistics process?

The following support questions have been summarized for supporting the development of return and reuse process of the case study:

- What different options there are when the items cannot be returned to the original vendor?
- What are the cost effects of those options and who will carry the costs?
- What facts are needed for decision making about what should be done to the items?
- What process steps the return and reverse process must have in order for it to work in practice?
- How could the overall process be made transparent?
- Who will participate in the new process and what are the roles?
- What different options there are for measuring the process?

The limitations of this thesis arise from the fact that the daily process needs to be improved. This thesis should have a realistic target. Some of the factors cannot be influenced and they must be accepted as given in this thesis: nature of the items, vendor contracts and reasons for returning items.

The complex nature of the items cannot be changed. The case study only includes the case organization’s product range. In this thesis only hardware (and software items connected to hardware) items purchased by the case organization are considered. These OEM items are purchased from third party vendors.

Process development is mainly needed from the point after vendor has rejected the return request. If vendor contracts can be improved, meaning that vendors will approve more return requests, it will be the best alternative, but at the moment it is unrealistic. The target of this thesis is not to try to improve the vendor contract, but to find effective ways to handle the items when return to the vendor is not possible by contractual terms.

Reasons why risk orders and incorrect orders become a return case are not considered, as long as the case fulfills the return preconditions. The risk order process is approved on company level. To increase the order correctness there are already several actions taken, but the nature of the issue is complicated and there are several root causes for the incorrectness.

Since this thesis should have a realistic target, also the resources must be taken into account when the target is considered. There are resources, time and know-how of the key persons available for the development work. There is a trade-in between resources, time and quality. There is no special budget for the development work. Thus, technical solutions need to work with the current programs available.

The development of the process and the changes in the different factors are constant. The process is continuously ongoing. The time frame for the empirical development case presented in this thesis is from October 2009 to May 2010. In the case study both short and long term development proposals are presented. The implementation of the long term development proposals are not in the scope of this thesis due to the fact that implementing those will take longer time than planned time frame for the case study.

The process should work without modifications, regardless of the physical location, individuals involved or the co-operation partners of the company. For this matter, some of the practical communication development with current warehouse provider is left out of the scope of this thesis.

This thesis is written from the point of view of the case organization, but of course the case company's overall benefits are considered. Thus, the solutions cannot be only beneficial to the case organization; they must also be in line with case company's interests. The thesis reflects ideas from the researcher's and from the key persons' point of view, who all are working in the case organization, but of course, should also have knowledge of the company's overall interests.

The return process described in this thesis is only valid for the OEM items. The supply chain in general and the return process of the company's core products have different characteristics. Thus, this process cannot be generalized in the case company. Some other company dealing with the items similar in nature and with similar overall supply chain might be able to get some hints from this thesis.

The theoretical frame of this thesis is build to support the case study. The reverse logistics is studied mainly from process and also from economical, thus saving money, point of view. No environmental issues are studied. The nature of the case study items is taken into account. Issues typical to consumer goods, such as customer satisfaction, are not covered. Certain issues are emphasized in the theoretical frame, such as process transparency, reuse options and financial impacts. These issues are essential to the case study.

1.3 Theoretical framework: Reverse logistics

Reverse logistics is defined as the return, repair, refurbishment, remarketing and disposition of products (Anderson 2009, 41). Reverse logistics is the process of moving product back through the supply chain to accommodate overstock, returns, detects and recalls (Blanchard 2009, 58). Several definitions can be found from the literature. Reverse logistics is also referred as returns management and reverse supply chain.

In the literature, the reverse logistics has received growing attention in the last decades. Already authors, e.g. Beckley & Logan (1948), Terry (1869), Giultian & Nwokoye (1975), had already paid attention to returns according to Fernández (2004, 32). Still reverse logistics was a fairly little studied concept in the beginning of the twentieth century. Nowadays the topic is studied because of the environmental matters and economical reasons. The studies are carried out mainly from the point of view of consumer goods and "green" thinking. Economical reasons are increasingly arising interest. Reverse logistics can cost up to four to five times more than forward logistics (Blanchard 2009, 58). Also several opinions that reverse logistics should be seen as opportunity and not a threat can be found. Reverse logistics offers an opportunity for improving transparency and profitability while lowering costs across the supply chain (Anderson 2009, 41).

In several logistics textbooks reverse logistics is briefly covered. Academic journals and logistics magazine articles can be found from the subject of reverse logistics. Two doctoral theses that relate to reverse logistics have been written in Finland: Reverse Logistics Implementation in Manufacturing Companies by Isabel Fernández (2004), and A multinational perspective to managing end-of-life electronics by Marianna Herold (2007). Also some master's thesis has have been written about reverse logistics in Finland.

This thesis concentrates on the reverse logistics theory from the process, decision making, and economical point of view. The nature of the case study items, OEM hardware, is noted, when studying the theory. The reverse logistics theory presented in this thesis does not cover all the aspects of the reverse logistics. Chapter 2 concentrates on the theoretical issues that are important to understand with respect to the case study. These theories will help to develop return and reuse process of the case organization and with cost effects in mind.

Chapter 2 consists of the following topics. The reverse logistics process and product reuse options are studied. Reverse logistics relates also to inventory management, thus, inventory management is discussed. Managing logistics information and features, like transparency, of well functioning logistics process are discussed. Reverse logistics process measurements are presented. Also the cost effects of reverse logistics are studied. The different challenges in developing reverse logistics are discussed.

1.4 Research methodology

The research methodology is briefly introduced in this chapter. The purpose is to explain how the research problem was investigated and why certain methods were used. The detailed description of research methods are in Chapter 3. Methodology is focused on the specific ways, the methods, that can be used in research when trying to understand the issues better (Erikson & Kovalainen 2008, 16).

The approach in this thesis is abductive research. An abductive approach consists of a continuous interplay between theory and empirical observation. Characteristics for abduction approach is that the original framework is modified step by step as a result of unanticipated empirical findings or successively gained theoretical insights. (Dubois & Gadde 2002, 559) In this thesis first the theory about reverse logistics is studied and then the case is studied accordingly. There is a constant interplay between theoretical framework and case study. The nature of this research is action research. Action research output results from involvement with members of an organization over a matter of genuine concern to them (Bryman & Bell 2007, 428).

A methodology is an approach to the process of the research, encompassing a body of methods. A case study is methodology that is used to explore a single phenomenon in a natural setting using a variety of methods. (Collis & Hussey 2009, 73-82) Research strategy in this thesis is a case study. The case is the most central feature of the case study research. The research questions are related to the understanding and solving the case. (Erikson & Kovalainen 2008, 115) The goal of this thesis is to develop the return and reuse process of the case study. Case study refers to a unique case with unique characters. A case study does not refer to a qualitative or quantitative study and to primary or secondary data used. The research problem, objective and information available and also nature of study must be considered when choosing methods. It must be noted that it cannot be decided whether qualitative or quantitative studies are better or more useful. (Blumberg, Cooper & Schindler 2008, 192-193)

The goal determines the methods of data collection and data analysis and problem solving methods used in this case. Empirical data for the case study is collected from different data sources. The case study of this thesis is mainly based on qualitative research method with primary data used. Data in the case study is mainly primary data from verbal source material collected from open interviews and group interviews. Some part of the study has characteristics from quantitative approach with secondary data, statistics, being used. Data types, qualitative and quantitative data, relates to the extent to which data is number based. Types of data are also primary, data that is collected through techniques such as interviewing and observation for the first time for the purpose of a particular study at hand, and secondary data, information which already is collected and available. (Crowther & Lancaster 2009, 74-75) Methods are often divided into methods of data collection and methods of data analysis (Erikson & Kovalainen 2008, 16).

In this thesis 8D (8 Disciplines) problem solving method is used from structuring the whole case study including data collection and analyzing. 8D is a method is aimed at improving a company's operational performance by eliminating defects in logistics processes. The U.S. government first standardized the 8D process as "corrective action and disposition system for nonconforming material" and later on Ford Motor Company popularized the problem solving process (Rambaud 2006, 2). The time horizon in this thesis is from October 2009 when the problem solving team is established to May 2010 when the results are evaluated and conclusions drawn. This thesis represents of events in period from October 2009 to May 2010.

Researcher works in the case organization as logistics coordinator also called as return coordinator. In the development project the researcher acts as a problem owner having an active role. Part of research data is retrieved from researcher's personal experience and daily observations on how the process works. Observational research is a technique of primary data collection through looking and noting. It generates data based on what people or systems actually do rather than what they say. (Crowther & Lancaster 2009, 121) The researcher has to be aware of her position in the case study, since there is a risk that it affects the course of the events. Researcher's position brings knowledge from the issue, but it might blind the researcher from some alternative solutions. The case study is mainly team work, which decreases the risk.

1.5 Structure of the thesis

Chapter 1 introduced the theme of this thesis from empirical and theoretical sides. The research problem, target and limitations are well defined. Theoretical framework is introduced. Also the research methodology is briefly described. Chapter 2 presents the theoretical framework for this thesis. The reverse logistics process is presented. Issues connected to reverse logistics process, such as inventory management, information management, logistics process measurement, financial impacts, are covered. The different challenges in reverse logistics process development are

discussed. The purpose is to support empirical part. Chapter 3 tells about the research and problem solving methods and about the evaluation. 8D problem solving method is introduced and it is described how it is used in the case study for collecting and analyzing the data. Also evaluation is discussed. This chapter also supports the case study. Chapter 4 is about the case study: developing return and reuse process. The empirical part will include the current process description and the pain points of the current process are described. Root cause analysis is presented. Development plan is formulated and implemented. The improved process is presented. and outcome is evaluated. Chapter 5 deals with the evaluation and conclusions drawn from the empirical part and also future development proposals are discussed. Chapter 6 summarizes this thesis and sums up the findings. The structure of the thesis is summarized below in Figure 1.

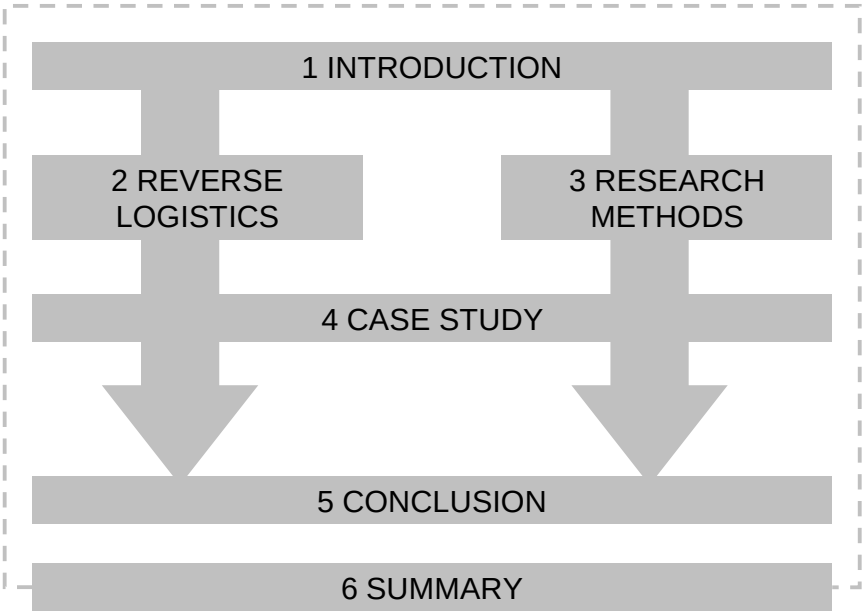

FIGURE 1. Structure of the thesis

2 REVERSE LOGISTICS

In this chapter, theoretical framework of this thesis is presented. The reverse logistics in theory is discussed with the purpose to support the case study. The theory is not applied to practice in this chapter. This chapter will not cover all the aspects of reverse logistics, for example reasons for returns, environmental aspects and customer satisfaction issues, as stated already in the limitations of this thesis. Only the issues important related to the case study are covered.

In following first the reverse logistics process is presented. Secondly, the connection of inventory management and reverse logistics is discussed. Thirdly, the features of information management connected to logistics process, and in this case transparency is the key feature, are considered. Fourthly, the reverse logistics process measuring is introduced. Fifthly, reverse logistics financial impacts are considered. Finally, the challenges in developing logistics process are discussed. The below picture illustrates, how the theoretical frame work is connected to case study of this thesis.

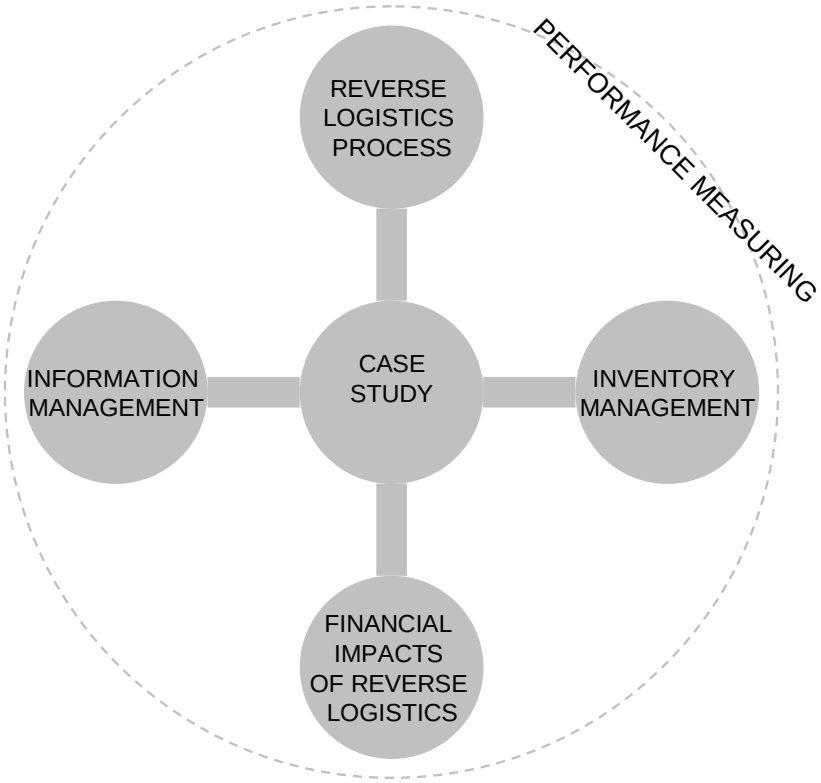

FIGURE 2. Theoretical framework’s connection to case study

2.1 Reverse logistics process

In following the reverse logistics process is presented in theory. It is essential to understand the reverse logistics process in theory, since the case study of this thesis is about developing the case organization's reverse logistics process of in practice. First, in this chapter there are covered topics, such as reverse logistics definitions; return categories; parties involved; systems for handling returns; and reverse logistics activities. Then, reverse logistics process steps are presented. The steps correspond to those presented in the case study. Product reuse options are also investigated in the case study, and thus, the product reuse options are also covered in theory. It has to be kept in mind that, the case study is all about developing the reverse logistics process.

There are several definitions for reverse logistics available. Reverse logistics can be seen as a process of moving goods from their typical final destination to some other point. The purpose is to capture value that otherwise would be lost or become unavailable, or for the proper disposal of the product. (Enarsson 2006, 201) Reverse logistics can be defined as: the process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the recapturing value or proper disposal. Thus, reverse logistics management represent a systematic business model to properly close the loop on the supply chain. (Grant, Lambert, Stock & Ellram 2006, 282) Reverse logistics is the return and disposition of inventories in a cost-effective and secure manner (Bowersox, Closs & Cooper 2007, 261). Reverse logistics consist of return goods handling and waste disposal. Reverse logistics moves products, money and the flow of information backwards through the supply chain. (Vogt, Pienaar & De With 2006, 13, 277)

These definitions for reverse logistics include the essential topics related to the case study, and thus, they are covered in the theoretical framework of this thesis. As stated in the definitions reverse logistics is process of moving goods. Those process steps of moving goods are presented in detail in this chapter. In addition to the movement of the goods reverse logistics includes also the movement of information and money. Without proper information flow the reverse logistics process does not function well. Reverse logistics has financial impacts and also impacts in the inventory management. These issues are discussed further in this theoretical framework.

Returns can be grouped in to five categories: consumer returns, marketing returns, asset returns, product recalls and environmental returns. Marketing returns consist of product returned from position forward in the supply chain. These returns are often due to slow sales, quality issues, or the need to reposition inventory. In addition to marketing returns driven by market issues, some marketing returns are driven by management practices. (Lambert 2008, 161-160) The returns described in the case study are marketing returns. These returns occur due to case company's risk order process or due to mistakes caused by incorrect ordering in the case company. As stated in the limitations of this thesis the reasons for returns are not further studied.

There are different structural solutions for handling reverse logistics: a centralized; a decentralized structure in the company; or outsourcing to a logistics provider. Reverse logistics process is found either as a subset of closed loop system or standing alone. A reverse system must be adapted to a specific situation, often with specific needs. The actual nature and weight of different determinants must be investigated when determining the structural solution. Reverse logistics has been increasingly linked to the general direct supply chain since in many cases the original supplier organization is in the best position to control the return process as well. The full process of shipments out and back by the same organization is defined as a closed loop supply chain. On the other hand, the different requirements and opportunity associated with reverse movements are increasingly driving the separation of returns from mainstream operations into specialized stream of activity. The traditional

business model is often not suitable to meet the requirements of this type of activity, and often the volumes are small or impractical to separate returns back to the original producer. By separating reverse logistics fuctions from overall forwarding distribution, reverse logistics is given the attention it deserves without drawing from resources in the supply chain to operate returns processing. A specialist body of knowledge develops around the disposition, for example, placement into secondary markets. (Anderson 2009, 42; Blumberg 2005, 8, 12; Enarsson 2006, 201; Gattorna, 2009, 156; Halldórsson & Skjott-Larsen 2007, 20)

The facts, that reverse logistic is a complex part of any operations and it is not in the top for priority of companies, complicate the situation. Reverse logistics is a complex part of any operation, not least because it often involves the retailers or manufacturer's customers and suppliers. This demand-side and supply-side intersection also operates with logistics and imperatives quite different to those of the rest of operation. The adequate return process and the dedicated persons should be in place, given the amount of capital tied up in returns, but too often the returns fall to the bottom of the priority list. Returns management process is rarely a top priority for variety of reasons. Reason can be that a company has too many "forward" problems for returns management to be perceived as a priority or company policy mandates that outbound orders always take precedence over return goods. An internal company structure that identifies who's responsible for the returns will keep details from falling through the cracks. (Gattorna 2009, 149; Rogers 2009, 29-30; Mollenkopf, Russo & Frankel 2007, 575- 577)

As stated earlier, the researcher works as a return coordinator in the case organization and also some other people involved in the process have some working time allocated to the tasks related to the return and reuse process, so the basic structure to manage returns is somewhat in place. There are several people involved in the return and reuse process and returns often fall to the bottom of the priority list of many people. In line with the case company's strategy, to all the first priority are the new customer orders. This is a reality that needs to be taken in to account, while developing the

return and reuse process. The demand-side and supply-side lack of interaction creates many challenges discussed in the case study of this thesis.

Reverse logistics includes the activities to support: returns management, remanufacturing, remarketing, recycling, and disposal. Returns management is designed to facilitate the reverse flow of products. Returns management is the supply chain management process by which activities associated with returns, reverse logistics, gate keeping, and avoidance are managed with the firm and across key members of the supply chain. The correct implementation of this process enables management not only to manage the reverse product flow efficiently, but to identify opportunities to reduce unwanted returns and to control reusable assets. Remanufacturing facilitates the reverse flow of product following its useful life. Remarketers use coordination and reverse flow to position and resell products when the original user no longer needs it. The long term profitability of the business should increase if the reverse logistics activities are properly managed. The management of reverse logistics activities by planning these activities, organizing all involved personnel and departments involved, hands-on directing of the activities, cooperation with the other departments and the effective controlling of all these activities. (Bowersox etc. 2007, 216; Lambert 2008, 159; Vogt etc. 2006, 276)

Reverse logistics process steps

Reverse logistics comprises the following steps: gate keeping, also called screening, to ensure that only certified materials are returned; collection; sorting out; repairing, recycling, repackaging, relabeling, restocking, reuse, resale etc.; and ultimate disposal (Dubey & Kumar 2007, 189; Gattorna 2009, 152). On average it takes 12 times as many steps to process returns as it does to manage outbound logistics (Blanchard 2009, 58). Below the reverse logistics steps are presented and the corresponding steps can be found from the case study. Essential related to the case study is to understand the reverse logistics process steps. Gate keeping is an important decision making state where it is determined if items are approved to be returned or not. Essential is also to

note that there are several alternatives in disposal state and to understand the opportunities offered by the secondary market. Also the time-sensitivity of returns is important to note.

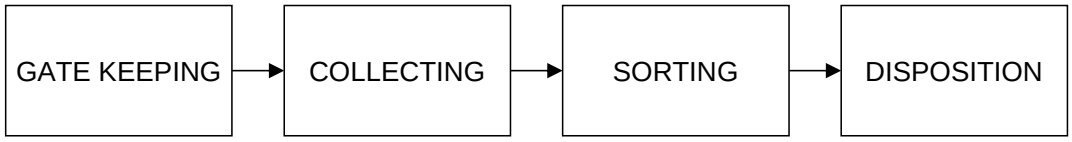

FIGURE 3. Reverse logistics process steps

Returns management encompasses activities such as avoidance and gate keeping, which are central elements to effective management of the return flow. Avoidance involves finding ways to minimize the number of return request. Care must be taken that the right products and product quantities are ordered and delivered. The correctness of orders will lead to a substantial reduction in the returning of goods due to the wrong quantities or types being ordered. (Lambert 2008, 160, 164; Vogt etc. 2006, 285)

Key management elements in reverse logistics include gate keeping to screen defective and unwarranted returned merchandise at the entry point into the reverse logistics process. Gate keeping involves the screening of both return request and the returned merchandise. Gate keeping means making decisions to limit the number of items that are allowed into the reverse flow. Successful gate keeping allows management to control and reduce returns without damaging customer service. The point of entry into the reverse flow is the best point to eliminate unnecessary cost and screen unwarranted returned merchandise. Gate keeping eliminates the cost associated with returning products that should not be returned or the cost of products returned to the inappropriate destination. Economical constrains, holding and transaction cost of excess inventory and physical constrains, capacity and space limitations, are faced, when trying to make an informative decision of how many products to take back and when to take them back. Local screening business rules are

needed to optimize path and indicate non-returns. Item coding is needed to enable tracking. Reason codes for returns are needed for further analysis. (Gattorna 2009, 153; Grant etc. 2006, 282; Gupta & Johar 2008, 558; Lambert 2008, 164; Mollenkopf etc. 2007, 578)

At collection state trade-offs are required between speed, consolidation and space. It has to be decided, are the returns done via forward network or separate network. Sorting requires business rules and dynamic decision support to determine disposition. It also requires specialized resources for efficient handling. Central return centers or processing facilities dedicated to handling returns work quickly and efficiently. Normally reverse logistics is managed by having a temporary storage location from which that materials are transported to the disposal, reuse, reprocessing, or recycling locations. The warehouse activity ensures that an item returned by a customer is valid per a customer order that is obtained from a system. After an item quality is determined to be valid, an item is disposed per the warehouse standards as a return to stock; return to vendor activity; vendor rework activity; or trash removal. (Gattorna 2009, 153; Grant etc. 2006, 282; Lambert, Stock & Ellram 1998, 20; Mulcahy & Sydow 2008, 415)

There are several solutions for disposition stage: sell-as-is, meaning resale through normal channels, via outlets or discount channels, via secondary markets; reuse, meaning repair, refurbish, remanufacture or modify, recycle components; dispose, meaning scrap, donate, secure disposal. Disposition is simply, what you do with the product now that it’s been returned. The reprocessing can be more or less light. Two groups can be discriminated: the first is the direct recovery of sell-as-is products, where returned products are in an as-good-as-new condition and so one can directly reuse, resell, and redistribute; the second group, process recovery, is where more elaborate reprocessing occurs. There’s money to be made in choosing the right disposition. Asset recovery disposes returned goods to maximize returns to the owner and minimize the costs and liabilities associated with disposition. At disposition stage the purpose is to maximize value recovery and minimize disposal cost and

environmental impacts. The decision is based on predefined business rules that are built into the system. (Gattorna 2009, 153; Rogers 2009, 30; Grant etc. 2006, 282; Dekker, Fleischmann, Inderfurth & Wassenhove 2004, 26)

Key management elements in reverse logistics include short disposition cycle times related to return product decisions, movement and processing to avert a lengthy ageing process on returns. Where there is an opportunity for resale, time is usually the key driver in the return process. Time to remarket is essential to time-sensitive returns, e.g. electronic equipment. Time-sensitive returns should be treated as a value stream, not a waste stream. The flow of returned products often represent an essential value for many firms, but often the value is lost because of lack of efficient returns systems or negative effects of time delays. The priority is to manage lead-times, avoid bottlenecks and support the operation with a flexible organization structure geared around identifying and quickly capturing market opportunities. The marginal value of time is a measure of the decline in market value due to time delays in the reverse supply chain. Much of loss in the return stream is due to time delays in processing the return flows. Timing in disposing decisions is critical because all items kept in inventory incur holding costs and carry risk of obsolescence. Many components become redundant as the years go by and eventually lie on the shelves of dead stock. Some items could cost more to hold rather than their actual remaining values. (Gattorna 2009, 154; Grant etc. 2006, 282; Gupta & Johar 2008, 558; Halldórsson & Skjott-Larsen 2007, 7, 17; Vogt etc. 2006, 96)

Many companies are discovering that they can maximize secondary market opportunities as a way to recoup some return on their returns. End-of-life products can be remanufactured, reused, recycled, or disposed of. Selling to secondary markets turns valueless returns into economic value and extending the life cycle of the original product. By more effectively managing the entire logistics process, it is possible to recover significant value from what was ones regarded as obsolete or unusable material to be trashed or destroyed. The secondary market businesses are primarily involved in the purchasing of unwanted returned goods at significant

discounts, for purpose of resale. However, because of the uncertainty in quantity and quality of the items taken back, planners have often felt discouraged to engage in such initiatives. Other factors that inhibit them from engaging in such activities include: less vertical integration, lack of efficient recovery process, and questionable profitability. Firms that choose to obtain additional value from items that have been returned must also consider sales cannibalization of first quality items and the impact of secondary markets on brand image. (Blumberg 2005, 168; Gupta & Johar 2008, 557; Lambert, 2008, 172; Rogers, 2009, 29)

Waste management comprises the management of waste in such a way that the business saves the most money on the handling of the waste. Waste management must be done in such way that least waste goes to the municipal or other dumps. The sorting of the waste can take place before the collecting or after the collecting of it by recyclers. The waste will be sorted into hazardous and non-hazardous waste. The main objective is to salvage most of the waste for recycling and reuse. (Vogt etc. 2006, 282-283, 285)

2.2 Inventory management

In this chapter the role of inventory management is introduced. Return and reuse process effects the inventories. The case company's objective to decrease the inventory values has been one of the driving forces of this thesis. In the case study the return and reuse process of the case organization is developed. Without understanding the effects of the return and reuse process to inventories, it is not possible to properly develop the process by doing root cause analysis, considering the pros and cons of the different process alternatives and finally selecting the new process model. In this chapter inventory management is presented from the point of view of reverse logistics and issues related to the case study are covered. Thus, inventory management is a wide area and it will not be all covered. In this chapter the objectives of the inventory management, types of inventory and inventory costs are introduced. Returns are

managed with purpose to minimize costs, but the opportunities the returns create to the company should be also considered.

Inventory management has received much attention in recent years, primarily from the point of view of eliminating as much inventory as possible. Inventory is an integral part of any supply chain. Inventory is a major use of working capital. It is now realized that holding excessive stocks is simply too expensive. A great deal of effort has been expended to eliminate unnecessary inventory without compromising customer service. The objectives of inventory management are to increase corporate profitability through improved inventory management, to predict the impact of corporate policies on inventory levels, and to minimize the total cost of logistics activities while meeting customer service requirements. (Gourdin 2008, 62, 85; Grant etc. 2006, 135)

Inventory costs

The total cost of acquiring and holding of inventory consist of components of purchase cost, ordering cost, and carrying cost. The inventory carrying costs are all the costs involved in holding inventory. For decision making purposes, the only relevant inventory costs to consider are those that vary with the amount of inventory stored. The four major categories of inventory carrying costs that do so are: opportunity cost, inventory risk cost, storage space cost and inventory service cost. Inventory opportunity cost, also called capital cost, is the return that the company could make on the money it has tied up in inventory. The cost of warehouse space and the value of the inventory both have an opportunity cost. Inventory risk costs are those costs associated with the obsolescence, shrinkage, deterioration, pilferage, lost and damage of inventory. Inventory service costs include insurance and taxes on inventory. The logistics activities that make up inventory carrying costs include inventory control, packaging, and salvage and scrap disposal. (Gourdin 2008, 65; Grant etc. 2006, 21; Vogt etc. 2006, 12, 98, 109)

Inventory management essentially encompasses balancing the cost of holding inventory on one hand with the cost of not holding it on the other. Goal should be to hold only what is necessary to satisfy customer requirements and manage it effectively. Inventory issues are closely related to those of customer service. The choice of the inventory level to achieve the desired level of service at the least cost is part of the management of optimizing a supply chain. Inventory management involves trading of the level of inventory held to achieve high customer service levels with the cost of holding inventory, including capital tied up in inventory, variable storage costs and obsolescence. Inventory carrying costs relate to the return and reuse process and must be considered in setting inventory levels. (Grant etc. 2006, 21, 17; Gourdin 2008, 63, 85; Vogt etc. 2006, 12, 108)

Inventories should be kept at minimum levels to prevent over-stocking and over investment. Inventory appears in the income statement and in the balance sheet of the business. It forms an important part of the current assets in the balance sheet and influences the net profit or loss of a business directly. Too many dead and slow moving inventories lead to a higher closing stock figure, which increases the net profit and thus the income tax payable by the business. The balance sheet figure will also be inflated. This means that the value of the assets will be inflated, in other words higher value is placed on the assets than what they are really worth. (Vogt etc. 2006, 92) Key management elements in reverse logistics include financial management policies to properly handle accounting and reconciliation issues related to returned products (Grant etc. 2006, 282).

Inventory types

Inventories are present in all business enterprises. If a company waits to produce its products until customer demands them, the customer is ‘pulling’ the inventory. Conversely, if a company produces products to a forecast in anticipation of customer demand then it is ‘pushing’ its inventory. The reasons for holding inventory are: achieving economics of scale; minimizing uncertainties in the demand and order

cycle; balancing supply and demand; ensuring stable employment; and buffering. A fluctuation in demand affects the inventory levels of a business enterprise. The reason for maintaining inventory might result form corporate policy, customer requirements, process variability, or other concerns. A reason for carrying an inventory can also be consolidation. It means that several deliveries are consolidated into one delivery. (Bowersox & Closs 1996, 393, 476; Grant etc. 2006, 422; Gourdin 2008, 266; Vogt etc. 2006, 92-93)

Inventories can be classified as follows: normal stock, buffer stock, in-transit inventories, speculative stock, promotional stock, seasonal stock, and dead stock. The normal stock is that portion of a business enterprise's inventory which gets depleted through normal sales. Buffer stock is held because of uncertainty in demand rate or length of the lead-time. Longer lead times complicate the holding of sufficient inventories and will result in a large buffer inventory. Dead stock is stock that has no value for a business. Dead stock refers to items for which no demand has been registered for some specified period of time. Dead stock might be obsolete to the company or throughout the whole industry. Organization might incur the costs associated with holding these items rather than disposing them, since the demand is expected to resume at some point in the future, or it may cost more to get rid of an item than it does to keep it. Inventory management involves keeping the surplus inventories as near to zero as possible. (Gourdin 2008, 64-65; Grant etc. 2006, 131, 135; Vogt etc. 2006, 92-93, 95-96)

Key management support is essential if inventory is to be managed effectively, because lower inventories have an impact on many different parts of the logistics system. Managers should ensure that the rest of the logistics system is functioning efficiently. It may be that inventory policies have evolved as a way to obscure other problems that should be dealt directly. By improving performance of the other logistics activities, such as transportation, order processing, and warehouse functions, for example, would lower the need for inventory. Managing inventory is much more complex when dealing with internationally dispersed markets, nevertheless there

must be an awareness of customer needs and an appreciation for the costs of utilizing inventory to cover up other logistics problems. (Gourdin 2008, 74, 83)

One of the most challenging issues in reverse logistics in general is the inventory management of returned items. A key problem with reverse logistics is that companies don't have their focus on the return cycle of product because they believe that it does not generate profit. If the company can efficiently handle returns, there is an opportunity for the company to increase profit margin and minimize loss. Reverse logistics is one way a company can get residual value out of an asset. The goal is to convert returned assets in to cash fast. If the inventory is moving too slow, it's losing money. It has to be remembered, that inventory ages in rapid speed. With high costs for items such as high-tech merchandise, that rapidly become obsolete many organizations are now paying inventory management much more attention. (Grant etc. 2006, 18; Gupta & Johar 2008, 558; Rogers 2009, 29-30)

Returns are often managed only with a cost minimization objective, but more comprehensive consideration should also consider the wider impacts and opportunities. Reverse logistics represents a huge source of untapped value. Explore new ways to reduce inventory levels. Simplifying returns can increase the speed of inventory back through the supply chain. Inventory can be further improved by reworking products into saleable condition, cannibalizing items for spares, recycling usable parts and selling excesses to jobbers. (Blanchard 2009, 58-59; Gattorna 2009, 152)

The connection between return process and inventory management has been illustrated in this chapter. The case company's objective to decrease the inventory values arises from the influence inventories have to the net profit or loss directly. The inventory management is balancing between the costs for having inventory and harmful effect of not having it. Related to the returns this means that every time return is approved, despite the fact that items can not be returned to the third party vendor, the returned items increase the case organizations inventory value. It has to

be evaluated whether it costs more to get rid of the items, meaning scrapping, or to keep them in inventory and seek for possible reuse. Effective reverse logistics process is able to get residual value out from the returned items. Also the time-constrain, meaning inventories become obsolete rapidly, has to be noted in inventory management. It would also be good to start thinking the potential and untapped value of returned items, instead of only costs. In short, returns have direct impact on the inventories.

2.3 Managing logistics information

In this chapter communication, information management, information systems, process transparency and forecasting are discussed. These issues relate to the topics presented in case study's root cause analysis. Lack of process transparency relates to the improper communication, inefficient information management and also inefficient supporting information systems. Also the lack of communication and co-operation between the different case company teams involved in the return and reuse process is discussed in the case study. While developing the case organization's return and reuse process these issues are taken into account. Also forecasting is discussed in this chapter, so that the importance and the benefits of it are noted.

One of the most important factors influencing logistics effectiveness in any organization is the communication process. Without good communications, logistics policies and procedures cannot be effectively transmitted throughout the firm, and feedback of information concerning the success or failure of those policies and procedures cannot take place. Accurate and timely communication is the cornerstone of successfully integrated and coordinated logistics management. (Grant etc. 2006, 304; Stock & Lambert 2001, 598; Vogt etc. 2006, 13)

Information is crucial component of any logistics system because it acts as glue holding that system together. The kind of information passed among supply chain members and its timeliness have a strong influence on the efficiency of the supply chain. Information regarding demand for, quality of the products, and other factors such as financing, will flow up and down the supply chain to keep every member informed of the current state of affairs pertaining to their products. This information must be timely and accurate as the manufacturing of the products must be adjusted to the demand as quickly as possible. (Gourdin 2008, 166; Stock & Lambert 2001, 76; Vogt etc. 2006, 279)

A firm's communication system may be a sophisticated information management system or a simple word of mouth communication between the individuals. Whatever the system, vital information must be available and communicated to appropriate individuals. Usually, greater inconsistency is associated with slower methods of information transmittal. Manual methods of information transmittal require more handling by individuals, and consequently there is greater chance of communication error. Information transmittal methods can be evaluated on the basis of speed, cost, consistency, and accuracy. (Stock & Lambert 2001, 22, 151)

Order processing system can directly influence the performance of the logistics functions. Order processing system can be used to improve communications, total order cycle time, and lead to inventory reductions and transportation efficiencies. The organization's order processing system is the source for great deal of data, so the nature of that system has far-reaching implications for the entire logistics process. How information is handled within the firm is equally important, with decision support systems becoming more common as a means of rendering information from all parts of the company more usable for managerial decision making. (Gourdin 2008, 166-167; Stock & Lambert 2001, 181)

The complexity of reverse logistics programs means that information support is absolutely critical. Key management elements in reverse logistics process include reverse logistics information systems to properly track returns, and measure disposition cycle times and vendor performance. For optimal reverse logistics efficiency and effectiveness, information systems and data management must be redesigned or expanded to accommodate returns. (Grant etc. 2006, 282; Richey, Chen, Genchev, Daugherty 2005, 830)

The supply chain planning system and the related information system seeks to integrate information and coordinate overall logistics and supply chain decisions while recognizing the dynamics between other firm functions and processes. The reason for planning system development is the need for visibility regarding location and status of supply chain inventory and resources. Visibility implies not only being able to track supply chain inventory and resources but also that information regarding available resources can be effectively evaluated and managed. Simply being able to identify shipments and inventory is not sufficient; supply chain visibility requires exception management to highlight the need for resource or activity plans to minimize or prevent potential problems. The management of reverse supply chain is challenging compared to regular supply chain because it is much more reactive and much less visible. Examples include, changing demand rates, multiple demand sources, variety of products, and logistical complications. Yet another challenge to information systems is offered by inventory control and value management of end-of-life products. (Bowersox etc. 2007, 261; Gupta & Johar 2008, 557) Visibility enables decision makers across the enterprise to become more strategic and effective in their critical thinking (Anderson 2009, 41).

The return and reuse process does not function efficiently without good communication. The information has to be timely and accurate for all the parties to be able to work efficiently. It is also important how information is handled and what is done with it. The proper feedback is important so that different parties are aware of the occurred problems. The challenge from case organizations perspective is to work

with both manual methods and sophisticated order processing system. The lack of visibility in the system can cause major problems. The transparency of the return and reuse process are vital for tracking the items location, inventory status, costs etc. and also to spot the possible reuse possibilities. Forecasting could give guiding information to the parties for decision-making.

Forecasting attempts to predict the future through quantitative or qualitative methods, or some combination of these. The essence of forecasting is to aid in logistics decision-making. Demand forecasting is investigation of the firm's demand for the item, to include current and projected demand, inventory status and lead-times. Logisticians need forecasts that assist in inventory control, shipment scheduling, warehouse load planning etc. Also considered are competing current and projected demands by industry and product end use. Demand forecasting is a way of reducing variability, this time in terms of expected versus actual sales. Demand forecasting entails estimating the future medium- and long term demand for products and services. Forecast of future demand for physical products should be as accurate as possible to ensure minimum inventories. Accurate demand forecasting is important when striving to satisfy customer needs without sacrificing efficiency. By having better data available from information management system, analyst can generate more timely and accurate forecast that more closely reflect environmental realities. The forecasting activity is often centralized in the marketing, planning, or business analysis area of the firm. (Grant etc. 2006, 179; Gourdin 2008, 74, 170, 172; Vogt etc. 2006, 94, 12)

2.4 Measuring reverse logistics process

In this chapter, performance measurement systems, especially logistics performance measurements related to the case study are introduced. In the case study the return and reuse process is measured. In this thesis evaluation is done from several different perspectives, one being based on the performance measurement of the return and reuse process. The performance measures are used in the case study in practice, thus, the measurement systems are covered in theory in this chapter.

Perhaps the most obvious use of performance measures is to simply report on what has happened within the organization, and between organizations, and to compare the results with previously defined targets. A well designed performance measurement system will systematically expose problems and their causes, therein providing management with a framework for informed decision making. Performance measures also play key communication role. Performance measurement is the primary tool at management's disposal for directing the behaviors with the organization. To fulfill the purpose of motivating people, performance measures must be clear, understandable and meaningful. In other words, people must be able to see the relevance of the measures to their jobs and to the company's objectives. When determining the objectives and measures management must look to the overall corporate objectives for direction. Goal alignment must persist throughout all sub-organizations with the supply chain, and each and every operational procedure, to ensure that no part is working at cross-purposes. (Gattorna 2009, 208, 211, 220)

Every company has some kind of measurement system that keeps track of various financial and operational performance measures. The term business performance refers to the efficiency, effectiveness and adaptability of a business. Effectiveness refers to the extent to which requirements from the environment are met, while efficiency refers to how economically the resources of the business are utilized. Performance measurement is a process of quantifying, tactical and operational actions. (Vogt etc. 2006, 352)

Organizational performance can be measured against many criteria. Of course, it is not enough to merely identify the dimensions of organizational effectiveness, although this is a necessary first steps. The second step is to prioritize the various categories of effectiveness and develop specific measuring devices to evaluate the level of effectiveness achieved by the logistics organization. Perhaps the most difficult process is developing the techniques or procedures needed to measure the criteria of effectiveness. Measurement requires the creation of internal and external monitoring system to ensure that objectives are met (Grant etc. 2006, 309; Gourdin 2008, 280).

Logistics management plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in the order to meet customer requirements. Monitoring and controlling logistics performance should mainly focus on two things: ensuring that the resources are used efficiently and monitoring expenses. In order to remain competitive, an organization has to ensure that all its resources are used as efficiently and effectively as possible. The monitoring and controlling of logistics performance focuses on ensuring that resources are used in the best way possible and that logistics-related costs are kept under control. Logistics performance measures specifically track certain process within the logistics framework. A performance measurement system must be designed is such way that it is able to accomplish the three objectives of monitoring, controlling and directing operational logistics employees. Logistics performance measures generally measure cost, customer service, quality, productivity and asset management in logistics functions. (Vogt etc. 2006, 353-355, 346, 362)

While performance measurements are commonplace in the forward flows of products in the supply chain, the return flows are rarely measured in a systematic way. However, it is important to also set up performance measures for the reverse supply chain. Return process measures can include: procedures for analyzing financial impact of returns; costs involved in returns; return rates; tracking the returns back to

root causes of returns; the time from customer complaints to refunding the money; quantity and quality of returns, etc. .Management accountants can use their analytical skills to highlight the financial benefits of improving reverse logistics process. Techniques such as quality costing and transparent performance measurement system have a significant role to play here. (Halldórsson & Skjott-Larsen 2007, 8; Lambert 2008 173; Bernon, Cullen & Gorst 2009, 42)

Hard performance measurements are based on facts and can be measured directly and accurately. Hard performance measures can be divided in to financial performance measures, like inventory levels, and non-financial performance measures, like inventory turnover. Another example of non-financial performance measures is total cycle time, the time from when need exists until the time it is satisfied, in other words total time it takes to get things done. Soft performance measures are intangible in nature and have to be measured indirectly. Customer satisfaction is an example of such a measure. A mixture of these performance measures is needed to give a balance view of the overall performance of a business. (Vogt etc. 2006, 353, 355)

A firm must be able to measure, report and improve performance, also material management activities. Inventory is an important aspect of material management. Inventory should be managed in such way that only a smallest possible quantity of inventory item is in stock at all times. This minimizes the investment in inventory. The lower the value of the closing stock, the lower will be the value of the net profit and the current assets in balance sheet at the end of the year. The key measure of effective inventory management is the impact has on corporate profitability. Effective inventor management can improve profitability by lowering costs or supporting increased sales. Inventory can be controlled by considering the amount of slow-moving inventory and comparing actual inventory levels and turnover with target and historical levels, for example. There are many ways to measure the effectiveness of the inventory management system, one being inventory turnover. (Grant etc. 2006, 135; Vogt etc. 2006, 97)

Examples of performance measures for inventory control are inventory turnover and inventory cost. Inventory turnover is a measure of inventory performance. Inventory turnover measures the speed with which inventory moves through a business, and thereby also the number of times inventory is turned during the course of a year. It is measured as: annual euro sales volume at cost divided by average euro inventory investment. All else being equal, a high number is preferred, indicating that inventory moves through the firm's operations quickly, rather that being held for an extensive period. A higher turnover rate reduces the investment in inventory and it should ensure higher profits for the business, but one must be careful to have sufficient amounts of inventory at all times to ensure customer satisfaction. Inventory turnover is also important factor when measuring asset utilization. (Grant etc. 2006, 135; Vogt etc. 2006, 75, 356)

As stated earlier, the target of this thesis is an efficient return and reuse process. Efficiency refers to how economically the resources are utilized, according to Vogt etc. (2006, 352). The performance measurement should be done against predefined criteria and target. Mixture of performance measures gives a balanced view of the situation. The efficiency of the process and the costs has to be controlled. Both the impact of return and reuse process on inventory levels and other financial impacts that return and reuse process have to be considered. Inventory levels and inventory turnover are ways of controlling the inventory. In the case organization the inventory levels and inventory turnover are measured and monitored monthly. The impacts of returns to inventory levels are also followed monthly.

2.5 Financial impacts of reverse logistics

In this chapter the costs of the returns are discussed. It should be noted that reverse logistics has also other financial impacts than inventory costs; the customer compensation and reverse logistics process costs. There are often hidden costs in managing reverse logistics. It needs to be highlighted that the reverse logistics costs needs to be monitored to enable proper decision making to take place in the process. The costs of the case organizations return and reuse process are to be considered, and thus, the costs of returns are also covered in theory.

The money will flow backwards, from the end-user through the members of the chain, to the point of origin. This is the case because as the products flow forward the money will flow backwards through the chain as the different customers pay their suppliers for the products delivered. When goods are returned for whatever reason, the money flow will go forwards as original supplier compensates the customer for the products returned. (Vogt etc. 2006, 279)

Reverse logistics will have a financial impact on business as it puts an extra burden on the cost of running the business. Reverse logistics process must be managed properly considering that the costs pertaining to it do not add value to the end products and are seen as unwanted costs. The reverse logistics must be managed in such way that the cost to manage these activities must be less than the benefits derived from it. The cost will include the purchasing costs, the disposal costs, the transportation costs, the recycling costs and the overall costs of managing these activities. The changing buying environment and changing method of buying has lead to an increase in reverse logistics. The more products are being sent back, the higher the reverse logistics costs will be. The reverse logistics costs add no value to the product or to the logistics function of providing the right products at the right place, at the right time. Care must be taken in the supply chain that reverse logistics costs are monitored. (Vogt etc. 2006, 285-286) Feature that is highlighted is the necessity

for reliable information on the costs linked with returns, as one of the key tools for decision-making processes (Fernández 2004, 192).

Failure to track the true costs of reverse logistics may result in losses. To measure the full impacts of returns, it is necessary to start with an understanding of the real value of the product. The product value can be measured as a single unit and also as a sum of the individual parts. When measuring the overall financial impacts of returns, it is important to recognize that some sales channels or specific partners have significantly lower rates of returns than the average. There needs to be a determination as product enters this reverse pipeline of how much time and expense there are to process it. It has to be evaluated: what will it will be sold for when it is done and if the resale value of the product is still more than the value of the sum of the parts. The satisfaction of customer demands has to be kept in mind while weighting the alternatives. (Mehrmann 2008, 44-49)

The cost of moving products backwards through the channel from the customer to producer may be as much as nine times high as moving the same product forwards from the producer to the customer (Grant etc. 2006, 19). There are other forgotten or hidden costs to manage reverse logistics. The amount of required handling phases needs to be evaluated. The amount of people in organization and time devoted that is required to manage this process needs to be known. There is a potential for many legs of freight in the complete reverse logistics cycle. Any unnecessary movement of parts or product is an exposure to non-value added cost. Every time that some one handles the product, it adds cost to the entire chain. Steps in the process must be measured, assigned cost and time metrics, evaluated, consolidated, or removed. Remove unnecessary steps and handling to save time and costs. Warehouse and storage costs apply for the space to receive, process, and warehouse, the product. The true costs of inventory, receipts and shipments needs to be systematically tracked as they occur. (Mehrmann 2008, 44-49)

The customer compensation, credit to the customer, is a visible part of financial impact to the case organization. Reverse logistics process costs on the other hand are not so visible. The failure to get reliable information about the true cost of returns can cause difficulties to proper decision-making. There are forgotten and hidden cost in return and reuse process. The reverse logistics process costs should be less than the benefits arrived from it. Due to the high value of the OEM products the successful reuse of items cover the cost for running the return and reuse process. Nevertheless, the costs need to be monitored closely.

2.6 Challenges in developing reverse logistics process

In this chapter the challenges in reverse logistics process development are discussed. These challenges are faced in the case study while developing and implementing the new return and reuse process in the case organization, thus improving logistics performance. First of all the logistics processes, also reverse logistics, must be in line with the company's strategy. Adding value by process effectiveness logistics can contribute to the company's results. Development of reverse logistics starts from capturing, analyzing and utilizing returns data. Developing clear rules for returns improves the effectives of the process. Critical factor of effective reverse logistics is communication and co-operation between the different parties. Benefits of good reverse logistics management include cost reductions to the company and added value for customers. These are also the benefits the case study is meant to accomplish.

Logistics strategic planning is a complex process that requires an understanding of how the different elements and activities of logistics interact in terms of trade-offs and the total cost to the organization. Only by understanding the corporate strategy can logistics best formulate its own strategy. Logistics can contribute to and support an organizations strategic planning process in a number of ways. In order to design a returns management system, the process team needs to first consider the role that returns play in their firm's overall customer service strategy and the ways returns

management might contribute to improved profits. Logistics managers must be constantly searching for ways to improve their operations. Service quality, productivity, and process effectiveness must all be addressed as appropriate if logistics is to constantly add value to the final customer. Process effectiveness can also be viewed as a measurement of internal customer service. This internal supplier-customer relationship is critical because it can have a direct impact on how well the firm services its final customers. The benefits of improved logistics include operating improvements, lower inventory and shorter lead-times, which can lead to strategic advantages, lower total cost and improved customer service. (Gourdin 2008, 276, 281; Grant etc. 2006, 387-389; Lambert 2008, 167)

Analyzing returns data

It is important to capture, analyze and utilize returns data to better understand and police the returns process, and improve the design of future products and services (Blanchard 2009, 59). There are a number of useful process analysis tools available for logistics mangers intent on improving the operational effectiveness of their units. These techniques can be used to help explain how a particular logistics process works, identify possible causes for problems, and suggest ways to improve. Utilizing process analysis tools can both enhance the effectiveness with which logistics process meets customer requirements, the service quality aspect of logistics, and improve the efficiency of that process, the productivity aspect of logistics. The end result is that the customer receives more value and the firm is able to utilize logistics as a source of competitive advantage. (Gourdin 2008, 266, 276)

A fundamental operational objective is continuous quality improvement. (Bowersox etc. 2007, 258) Process improvement and the recognition its results should include both continuous as well as breakthrough improvement. Continuous improvements often come about from altering the existing process and generally occur within functions. Breakthroughs involve major process changes that often are cross-functional and cross-organizational in nature. (Gourdin 2008, 265)

It is important to analyze and describe how it might be possible to develop logistics systems for the handling of returned goods. External factors are factors over which companies do not always have control, but ones that will certainly influence the layout of their systems in the future. Internal factors, for example, computer systems, a system for following up costs, and better product information, must be prioritized and formed as a single unit so that companies can get both better information about the situation, and provide a relevant basis for improvement. (Enarsson 2006, 215)

The register over returned goods should be used for following up the returns, as this will give possibilities for following up cost developments. (Enarsson 2006, 222) Costs must be accurately documented and archived for cost analysis and for applicable compliance. Look for bets practices and identify hidden costs by collaborating with partners and peers. The result is continuous contribution to the profitability, avoiding disastrous decisions with hidden costs, and charting a clear course for success. (Mehrmann 2008, 44-49)

Guidelines and co-operation

The effectiveness of each return process stage depends on clear guidelines. A clear set of strategies around the major types of reverse movements are needed in order to optimize the financial and sustainability impact and to protect the core operations. When designing a returns management process, mangers need to consider different types of returns and develop procedures that are appropriate for each one. Management must consider the degree to which goals, rules, and procedures for logistics activities are precisely and explicitly formulated. The objective of the strategic portion of the returns management process is to construct a formalized structure through which the operational process is executed. It provides the blueprint for the implementation of returns management. The internal flow is a consequence of how a company handles the reception and registration of returned goods. There should be clear instructions about where the goods should be then sent. When reception has decided the status of a returned product, there are several alternatives

for forwarding the goods, and clear rules for the internal flow are then of extreme importance. (Enarsson 2006, 222; Gattorna 2009, 152-153; Lambert 2008, 162, 165; Gourdin 2008, 289)

As logistics channels become longer and more complicated, involving more channel members, efficient coordination becomes the key to effectiveness (Gourdin 2008, 168). In actual practice, some of the most challenging integration issues involve cross-functional trade-offs within a specific company. Functional management is deeply embedded as best practice within most firms. (Bowersox etc. 2007, 257) It is challenging to find the mechanisms, by means of which co-operation between different functional teams within a firm or between different actors in the chain, mainly those engaged in the reverse chain, could be effectively motivated and stimulated (Fernández 2004, 194). In inventory management the requirements for both manufacturing and marketing have to be met continuously. (Vogt etc. 2006, 12) Logistics cannot deal effectively with reverse logistics issues in isolation. It must interface with manufacturing, marketing, purchasing and packaging engineering. Decisions made in each of these areas have impact on the ability of logistics to conserve resources and achieve goals. (Grant etc. 2006, 409)

Establishing a reverse system requires a lot of coordination and integration. In many organizations the reverse logistics activities and responsibility is fragmented, there is little data captured or analysis of cost or impact and there is little visibility across the organization. An important factor for the development of logistical return systems is the employees and their competence and experience, especially for the receiving and handling of returned products. There are other matters to consider compared to a forward system, which means demands for knowledge and education for the participants. Co-operation and the sharing of information is a key factor for the successful creation of a reverse system. The employees have several alternatives for making decisions, and these decisions are strongly related to costs. It is therefore important that the correct decisions are made about the fate of any returned product. When it comes to larger flows, it is necessary to have a very clear picture over

responsibility, and competent personnel, who can, for example, handle a registration system. It can cause considerable expense to handle returns only when there is time for it. If return movements are irregular, it means they are time- and resource-intensive, and in mixed operations this need to respond intermittently usually draws that time and resources from the forward operations. In some cases it happens that returns are considered as less important to handle. (Gattorna 2009, 151; Enarsson 2006, 204, 221)

Benefits of reverse logistics management

Benefits to firm from practicing reverse logistics management include cost reductions, added value for customers and proper compliance with legislative regulations. Critical success factors for reverse logistics are management and control by mapping or flowcharting the reverse logistics process through the firm, developing management system, educating customers, employees, suppliers and others supply chain members, and developing partnership to achieve reverse logistics goals and economies of scale. Critical success factors include measurement by adopting full product life cycle and end of product supply chain. (Grant etc. 2006, 282-283).

Returns provide a revenue-generating opportunity via value recapture. Good return system enables quickly placing the returned item for resale before value depreciates. To be most effective, returns must always work in conjunction with forward flow. Managing the returns channel as a business process offers the same opportunity to achieve sustainable competitive advantage as managing the supply chain from an outbound perspective. Returns have become not only a potential profit center but also critical component of every company’s overall supply chain. Companies must recognize that reverse logistics has become an important source of opportunity for improving visibility and profitability and lowering costs across the supply chain. Effective process management of the returns channel enables the identification of product improvement opportunities and breakthrough projects. (Anderson 2009, 42; Lambert etc. 1998, 535)

The challenges presented in this chapter can be also seen as risk to the development project of return and reuse process. Although the development of return and reuse process is fully in line with the case company's strategy, it has to be noted that there are several development projects on going in the case organization and internal priorities might have an effect on the project. By reasoning the development needed and development proposals, the importance of the return and reuse process development is seen. For forming adequate reasoning the data analyzing and different performance measurements are vital. There might be also some unexpected external factors affecting the development of return and reuse process, and if needed, the development plan has to be modified accordingly. Continuous improvement is always time consuming and demands long-term commitment. There is no quick fix and that needs to be understood. Possible causes for the problems can be difficult to indentify in complex and long process involving several channel members. Responsibility is fragmented and there might be lack of competence among channel members. The development task is demanding due to fact that there are several issues that needs to be tackled in different areas. Co-operation between different functional teams and information sharing is one of the challenging issues in the case study. Creating clear guidelines and instruction is extremely important so that smooth flow of goods, money and information can be guaranteed. The management's and team's support are essential for the return and reuse process development to work.

3 RESEARCH CONTEXT AND METHODS

The purpose of this chapter is to support the case study. The case company is introduced and research methods, problem solving methods and also the evaluation methods used in the case study are described. An important task of this chapter is to cover data collection and analyzing methods. 8D problem solving method and root cause analysis tools are emphasized, since they are used for finding the core of the problem in the case study and at the end the solution. Different measurements and evaluation methods are introduced. Also if deviations are made from the methods, the reasons are presented. The actual collected data, analyses and evaluations will be presented in the case study in Chapter 4.

3.1 Case company presentation

The case company is a large multinational company providing telecommunication network solutions and equipment to its customers globally. It is one of the largest companies in its field with revenues exceeding 15 billion euros in 2008. The company's customers are communication service providers. The mission of the company is to help communication service provides to build more valuable customer relationships by providing them turnkey network solutions. Case company's strategy is to focus on the end customer; the customer comes first. The name of the case company is not revealed, due to the confidentially reasons. Some parts of the case company presentation have been stripped down for the same reason.

The case company consists of several business units one of which is Operations. Operations unit is divided to several subunits and the case organization is one of these subunits. Thus, the difference between the definition of case company and case organization must be noted. The case organization is part of the logistics operations of the case company. The case organization is responsible for providing deliveries of the OEM products to the customer teams. OEM products include hardware, software and services purchased from third party vendors. As stated in the limitation of this

thesis, only hardware items, and software related to the hardware, will be dealt with in this thesis. Management of the OEM supply chain, also reverse logistics, is in the responsibility of the case organization. Receiving orders, purchasing from third party vendors, related logistics activities and also financial actions are daily tasks in the case organization. The wide variety of items and configurations make the order handling, purchasing, delivering and also handling returns a very complicated task.

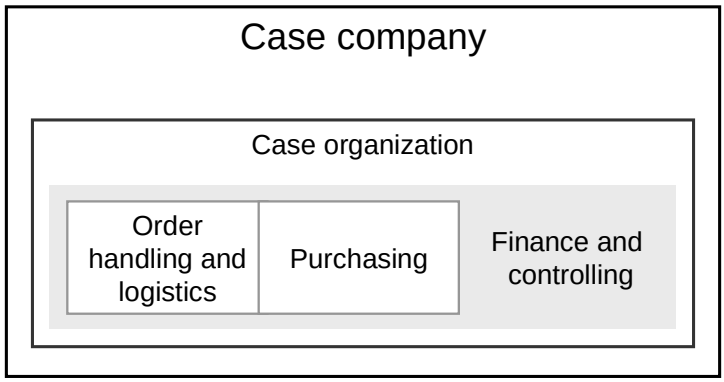

FIGURE 4. Case organization

The case organization has been divided into teams. The teams are responsible for different tasks. The teams that this thesis involves are: team responsible for order handling and logistics, team for purchasing hardware form third party vendors and finance & control team, which is in matrix with the mentioned two teams. In team responsible for order handling and logistics work logistics coordinators. Researcher works in this team as logistics coordinator also called return coordinator. Team is responsible for receiving the orders from the customer teams, checking the orders and releasing the orders to the purchasing team. Once the purchasing is done, depending on the delivery mode of the customer team, the logistics coordinator takes care of the different logistics activities and invoicing. In other words, logistics coordinator delivers the items to the customer team as agreed. The team that purchases items from third party vendors creates a purchase order once they have received an order from the logistics coordinators. The buyers take care of the purchasing and ensure the items are delivered as agreed and finally the vendor invoice is approved by the buyer. Finance and controlling team is in matrix with logistics coordinators team and with

the buyers' team. Finance and controlling support and instruct these two teams about finance and control issues, such as inventories, invoicing and SOX controlling etc. Also other teams might be included in the case study, if needed and they will be introduced in the case study.

The OEM configurations are often very complex. Essentially the deliveries are configured to specifically meet each individual customer needs and, thus, the configuration of the customer deliveries can vary significantly. There is a large variety of different products and configurations available. Products can consist of hardware and software from several third party vendors. Some integration work might be done to the items by the third party vendors. An important remark is that the OEM items can be extremely expensive. The product life cycle varies depending on the products, and new versions of items might come out in rapid speed.

The case organization has customer teams all over the world. The customer team is usually a country organization of the case company. The customer team does business with the end customers, which are usually telecommunication operators. The strategy of the case company has an impact on the priorities and way of working in both the case organization and customer teams; the end customer comes first. The pull supply chain is in use and the case organization purchases and delivers items only against the customer teams' orders. The case organization focuses in ensuring fast and smooth deliveries that enable customer teams to meet the end customers' needs. Currently the order correctness is a burning issue between the case organization and the customer teams and several actions are taken to improve the order correctness. In period 10/08-09/09 in average 42% of the orders placed by the customer teams was incomplete or incorrect (Order Engineering Logistics Manager 2009).

Products can consist of items that are supplied by different vendors from different locations. There are alternative ways of delivering the items to the customer teams: either the items are delivered directly from the vendor or the items are delivered from the vendor to the OEM warehouse for consolidation and then delivered to the

customer team. There are several factors that determine if the items are first consolidated to the OEM warehouse. Some countries demand that the consolidation is done and some business reasons might demand that the items are first consolidated. All the risk orders, which means that there is no end customer contract at the time order is placed by the customer team, are always consolidated. These risk orders sometimes turn into return cases, if the deal with the end customer fails. In the period 09/09 28% of the items were ordered under risk order title (Business Analyst 2009).

3.2 Research method

Method is a theoretically informed way, or technique, for collecting and analyzing empirical data (Erikson & Kovalainen 2008, 307). 8D problem solving method will be used to help structuring the case study and the development process. It guides to systematically and effectively resolve a problem. 8D stands for Eight Disciplines and is also know as G8D (Global Eight Disciplines) and TOPS (team-oriented problem solving). 8D process is a step-by-step problem solving methodology popularized by Ford Motor Company (Hua, Yang, Coulibaly & Zhang 2006, 117). The methodology is useful in product and process improvement (Rambaud 2007, 2). 8D asks teams: “What was wrong with the system that allowed this or similar problems to occur in the first place?” (Heck & Smith 2005, 8). 8D is best used in problem solving situations that deal with special causes (Smith 2005, 10). 8D is useful, when problem repeats happening and the problem is hard to define. It is a methodology that gets to the root of a problem and its permanent solution. 8D problem solving system should not be confused with a corrective action system. If problems are not worked through t root cause, one will be forever fixing the same problem. (Rambaud 2007, 4-5)

Problem solving is a social activity. People involved with the problem should participate in the problem solving process. (Rambaud 2007, 7) 8D problem solving method is used in the case company and some of the team members have participated in 8D workshop. Focus is on team work and this makes the method suitable for the

case study of this thesis. For the new process to work in reality, commitment is needed, and it will be achieved by the key people participating in the development of the process. Team members' overload of unresolved recurring problems in the return and reuse process can be tackled by developing the process. Also team oriented method is needed because of the complexity of the problem. The knowledge of the team members is essential. Team gets to the root of a problem, develops the solution and also checks that the solution works. Structured problem solving method guides the team and makes it easier to achieve the goal in process development. It makes sure that no essential steps are skipped or the process is not left unfinished.

In qualitative research, methods are considered both as practical tools and as framework for engaging with the analysis of data. Data collection and analysis are closely related to each others. (Erikson & Kovalainen 2008, 300) In the following text, 8D steps are described in detail together with the related activities for collecting and analyzing data, solution development and implementation and evaluation methods. The actual data and information related to the case is presented in the case study in Chapter 4. The steps of 8D are presented in the below Figure 5.

1D	Establish a team
2D	Describe the Problem
3D	Implement temporary solutions
4D	Find Root Cause
5D	Develop permanent solutions
6D	Implement permanent solutions
7D	Prevent Recurrence
8D	Evaluate outcome

FIGURE 5. 8D Steps

3.2.1 Defining the problem and collecting data

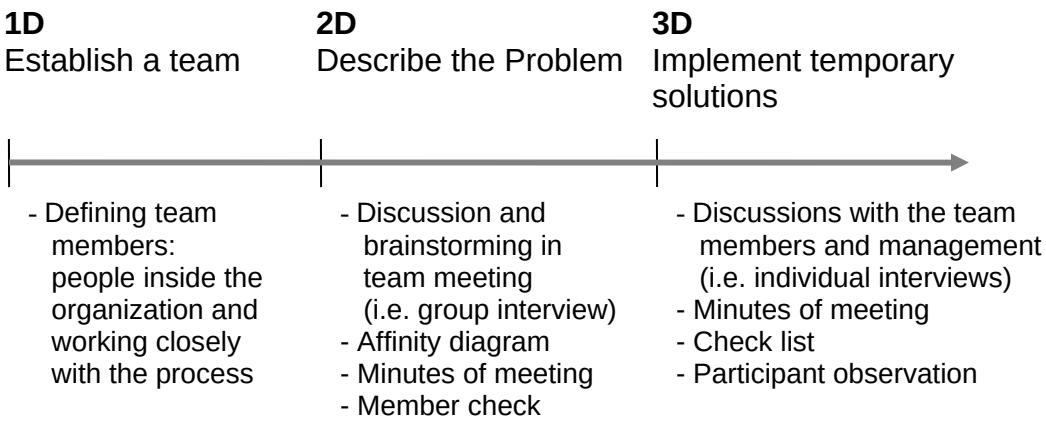

FIGURE 6. 8D steps: 1D, 2D, 3D

In Step 1D team is established. Development project team is a group of people who temporarily share and perform activities based on time-defined mutual goals (Yarbrough 2009, 10-11). Team should be cross-functional and consist of people with the right mix of skills, experience, and authority to resolve the problem and implement solutions (Rambaud 2007, 13). In this thesis, team members, also referred as key persons, are people inside the case organization with different tasks in the return and reuse process all working closely together. There are key persons from the three teams: order handling and logistics team, purchasing team, and finance and controlling team. The key persons from these three teams form the team that starts the development process. When needed, also other persons will be included in the development work. Stated research question and research objectives demand that team members play an important role in the empirical case. Although team is essential, it also needs a problem owner. The individual that gathers as much input as needed, from as many sources as required to resolve the problem efficiently (Rambaud 2007, 13). The researcher works in the case study as problem owner.

Step 2D is about describing the problem. The purpose is to identify the problem areas and collect data about them. Then the problems are prioritized and a problem statement is written. Well formed problem description is a clear, concise, multi-perspective, in-depth view of the problem collected from as many information holders as possible. (Graham 2009; Rambaud 2007, 19)

Important part of the data in this case study is collected from team meetings, which can also be called group interviews. Data about the problems and pain point of the current return and reuse process is gathered by inviting the team members to a meeting to discuss the topic, in other words doing an unstructured group interview. Group interviews are used where the interaction between the members leads to data which otherwise might not be available (Crowther & Lancaster 2009, 148). Unstructured and open interviews are used in this thesis. This type of interviewing is particularly useful for exploring a topic intensively and broadly and from participant's point of view. In unstructured and open interviews there is freedom to move the conversation in any direction of interest that may come up, but often there is some guiding questions or concepts to start with. (Erikson & Kovalainen 2008, 82)

In the team meeting called up for describing the problem also group brainstorming is used. Team members are given an opportunity to tell all the points which are not working in the current process from their opinion and all the points are written down. Brainstorming is a technique for quickly generating ideas, for example identify problems, in a group setting. Successful brainstorming techniques include gathering people familiar with the issue, careful definition of the issue, suspension of judgment, creation of a save environment for participants to express ideas and build progressively on ideas generated. The interaction between the members is an advantage and members can inspire each other, build upon the contributions made by others and develop ideas through a lively discussion. On the other hand some might hold back their own ideas. Thus, outcome can be biased towards what majority of the group thinks. (Blumberg etc. 2008, 390; Gourdin 2008, 268; Varkey, Hernandez & Schwenk 2009, 52)

After ideas are generated, an affinity diagram technique is used to combine similar ideas. Participants then vote on the most reasonable ideas and work further to refine the top three to six ideas. (Varkey etc. 2009, 52) Affinity diagram technique gathers large amounts of data and organizes it into groupings based on the natural relationship between each item (Brassard 1996, 4). After the team meeting the problems and pain points, which are written down in the team meeting, are then organized and categorized by using affinity diagram technique. Headline to each category is given. The problem owner will do this and also write the minutes of meeting.

The minutes of meeting are sent to the participants for review. They are also asked to vote for one of the most important development topics in their opinion. Member check is a way to increase the quality of the study. In practice, it means that participants are let to check the interpretations of what they did and what they told. Instead of check the compatibility of researchers' interpretations with participants, member check can be a process of establishing dialogue between researcher and the participants of the study. (Erikson & Kovalainen 2008, 293) Discussing the research findings with participants to obtain their reactions and opinions can give greater confidence to the validity of the conclusions (Collis & Hussey 2009, 182).

Documents form a rich source of evidence and documents and interviews supplement each others (Blumberg etc. 2008, 378). Documents in this thesis take many forms, including minutes of meetings, notes, process flowcharts and statistics. These documents will be useful when the development process proceeds so that there is always a record where to base the decisions and where to refer. From each team meeting minutes of meeting is written and given to the participants for review. Notes from the individual interviews and also from the observation are done. Financial statistics about inventories are available. Process flowcharts are drawn from the current return and reuse process and from the new process. Flowcharts provide a pictorial display of the process helpings to define the actual processing steps and logic flow for carrying out an activity. Flow-charting helps to identify weakness in a

process, such as bottlenecks and gaps. Flow-charting assists in developing, describing, and documenting improvements to the process. (Gourdin 2008, 266)

Interviewing is some of the most effective ways of collecting data. In depth interviews the issue is covered in some detail. (Crowther & Lancaster 2009, 148) Data is retrieved from individual interviews of team members and other people holding important information in addition to the team meetings. Individual interviews are performed to gather deeper information about issues pointed out in the team meetings. The valid information collected from individual interviews and from observation is shared to the team during next team meeting.

In this thesis qualitative data for the case study is also collected by participant observation. Observation is done about what functions well and what not in the process in practice and how the changes influence the process in real life, what is decided and what is then actually done in practice. In participant observation method the researcher is fully involved with the participants and the phenomena being researched (Collis & Hussey 2009, 154). The major advantage in participant observation is that it offers access to information that is not available otherwise. The deep involvement carries with it a risk: the researcher may lose their neutral view. Observation can interfere with participation and vice versa. The participant observer's role may influence the way others act. (Blumberg etc. 2008, 352, 379)

Step 3D, implement and verify temporary fix, is an optional stage, which might be needed to control the effects of the problem. First it is needed to identify the problem areas which need temporary solutions. The point is to minimize the effects of the problem until permanent corrective actions are found. The temporary solutions' effectiveness needs to be monitored. (Graham 2009; Rambaud 2007, 37) In the case study the temporary solution is identified by using the data collected about the pain points. Also discussions with the team members and management will generate ideas about the possibilities that are easily accessible for giving first aid to the certain pain point. A check list is used to ensure implementation and the results are recorded.

3.2.2 Analysis

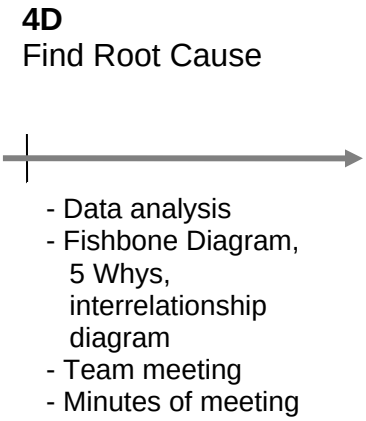

FIGURE 7. 8D step: 4D

Analysis is the process of turning data into information. There are three steps in analyzing qualitative data: data reduction, data display and conclusion drawing. Data reduction sharpens, sorts, focuses, discards and reorganizes data. Data display is a summary of data in diagrammatic form that allows conclusions to be drawn. It is essential to establish systems and procedures to manage and organize the raw data collected (Collis & Hussey 2009, 167-171, 183; Crowther & Lancaster 2009, 176, 194-195). At this point, it is important to analyze the data about problems and pain point and all the additional data gathered to find the root cause and get further with the problem solving. At the end the purpose is to find answers to the research questions.

Step 4D is the key for finding root causes. Root cause is the real or underlying reason why a problem occurs. The purpose is to identify the possible causes and select the most likely causes and also verify it really is a root cause. It is important to distinguish between cause and symptoms. It is best to deal with the root cause rather than deal with the symptoms of the problem. The problem is best solved by attempting to correct or eliminate root causes, as opposed to addressing the obvious symptoms. A root cause is a factor, which, if changed or removed, will permanently eliminate the deviation from the desired standard of the work process. Root cause of

the problem can be identified by creating a fishbone diagram or continually asking "why" until root cause is found. (Graham 2009; Rambaud 2007, 43; Varkey etc. 2009, 52; Schwalbe 2009, 182) In this thesis step-by-step fishbone diagram and 5 Whys technique are used to help to identify the root causes. Interrelationship diagram is used for showing the relationships between the development categories and to illustrate the influence of them on the overall return and reuse process.

Ishikawa diagram also known as fishbone or cause-effect diagram helps to work backwards to diagnose root causes. There are two main types of fishbone diagrams: one is traditional diagram with generic categories and the other one is step-by-step diagram that begins wit the fist step and works backwards. Errors early in the process often cause the biggest effects. Cause-and-effect diagram illustrates the relationship of potential cause, reason that situation occurs, to an existing effect, situation being analyzed. (Arthur 2007, 126; Gourdin 2008, 266)

5 Whys technique is also called Why-Why analysis. The root cause analysis method involves asking the question "Why?" in reference to the initial event and repeating it again at least four more times in response to each answer. Each repetition of the question can uncover a deeper level of contributing causes. (Varkey etc. 2009, 52) The 5 Whys is a technique developed in manufacturing that helps to get to the root of a problem. Consultants know that by identifying the cause of a problem, the problem is 80% on the way to being solved. (Adams 2008, 16, 18) Danger in 5 Whys techniques is that it is done fast, since the trade-off for speed is inaccuracy. The best way to enhance process knowledge is thorough use of analysis based on evidence, both actions and conditions. (Willis 2009, 49)

An interrelationship diagram shows the connection and natural relationship between different ideas or constructs identified for quality improvement. Often used in combination with brainstorming and an affinity diagram, the interrelationship diagram is based on the knowledge and expertise of the quality improvement team in identifying critical linkages across different concepts. (Boyer & Verma 2010, 414) This tool takes complex, multi-variable problems and explores and displays all of the interrelated factors involved. It graphically shows the logical and often causal relationships between the factors. (Brassard 1996, 5)

Fishbone diagram, 5 Whys analyses and interrelationship diagram are created by the problem owner to support the analysis. The diagrams and analyses are presented to the team in the team meeting. The team members' comments are recorder. If needed, the diagram and analyses is modified during the team meeting. Minutes of meeting are written and given to team members for review. Using several tools when identifying the root cause will generate ideas about the root causes. It is essential that several aspects are considered.

Triangulation indicates that number of different and independent methods of data collection and analysis has been combined (Crowther & Lancaster 2009, 199). Triangulation is a process of using multiple perspectives to refine and clarify the research findings, like combining qualitative and quantitative materials in the same study and using several methods and techniques of analysis. Triangulation draws the idea that the reality can be approached from different viewpoints and using these different views adds to the overall understanding of the researched field. (Erikson & Kovalainen 2008, 292-293) In the case study triangulation is used in several points. Several data collection methods, like group and individual interviews, observation, documentation, are used. Root cause analysis is done with different analyzing tools: fishbone, 5 Whys and interrelationship diagram. Also in the case study qualitative and quantitative, mainly statistics about inventory values, material are combined.

3.2.3 Solution development and implementation

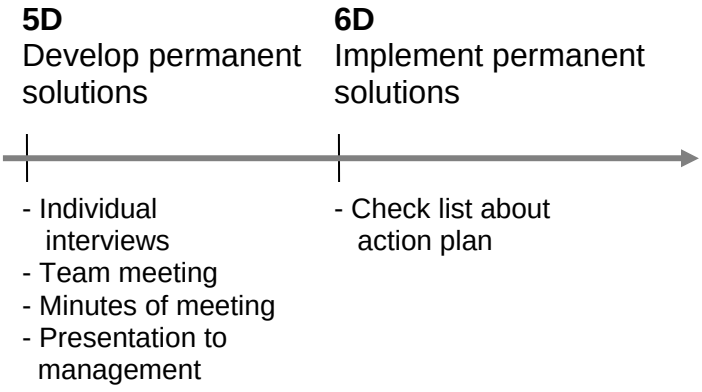

FIGURE 8. 8D steps: 5D, 6D

Step 5D is about developing permanent solutions and selecting the most suitable and realistic ones. Action plan for the implementation of the solutions is created. The potential risks of the action plan needs to be identified. The permanent solutions and the action plan are revised by the team. As a supporting tool, solution selection table is used. Solution selection table makes it easier to summarize the properties of possible solutions, making it easier to select the best solution. Solutions are either corrective or preventive. Corrective solutions are normally fixing something that formerly worked. Preventive solutions are those that will prevent the problem from happening again. Solution description tells, who are involved in the solution, what is the timeframe, what and where changes are needed to implement this solution, what are the trade-offs. The decision to implement specific solutions can involve getting approval from various levels of management depending on the cost and risk of the solution. (Graham 2009; Rambaud 2007, 58-66) An effective solution must prevent a recurrence of the problem, be within ones control to implement and be in alignment with the goals of the business. Additionally, it cannot create another problem in the process. (Willis 2009, 47)

After root cause analysis the problem owner seeks for additional information from individual interviews and observation of the current status of the related issues. Problem owner writes development proposals for short and long term. Problem owner also determines the next action steps. The development proposals are first reviewed with team members and their opinions are recorded and development proposals are modified accordingly. The development proposals are presented to management with proper arguments. If needed, development proposals are modified based on discussion with management. After management approval, implementation of development proposals starts.

In Step 6D the permanent solution is implemented. The action plan is followed. The outline of the solution implementation plan is to outline of what needs to be done and by whom. It is important to maintain the communication with the team members and collect information about the effect of the solution. Review milestone is set throughout the implementation and any changes to plan are documented. Data should be collected and monitored around the problem to make sure that the permanent solution is actually working. (Graham 2009; Rambaud 2007, 73-74)

The implementation is done according to the action plan. Problem owner's active role means also that the problem owner performs several tasks from the action plan. Problem owner also monitors that team members perform the tasks agreed to be done by them. The status of the task is changed to 'done' in the action plan ones the task is performed. The short term development solutions are performed in the case organization during the timeframe of this thesis work. The implementation of the long term development proposals will start, but will not get finish in the near future. As stated in the limitations, the implementation of the long term development proposals is not in the scope of this thesis.

3.2.4 Evaluation methods

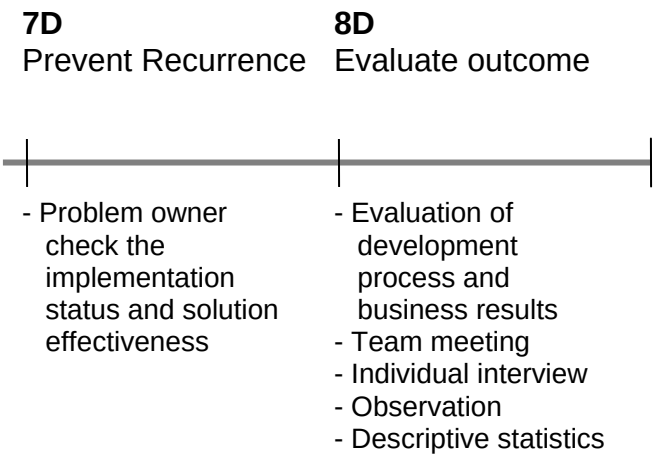

FIGURE 9. 8D steps: 7D, 8D

In 8D problem solving method steps 7D and 8D are prevention steps. By directing corrective measures at root cause, it is hoped that the likelihood of a problem recurrence will be minimized. In step 7D the week points in that allowed the root causes to emerge are identified and eliminated. The information obtained during the process is used to identify the location, processes, and times when similar problems are likely to occur, or there is a similar vulnerability to the problem. This will enable to take preventive actions. Human factor should not be forgotten. People tend to go back to their previous mindsets and procedures, if support for the permanent solution is not available. An audit is an inspection and review to ensure that a process, activity or solution is implemented and is performing according to prescribed specifications. Normally, an audit takes place before the problem is officially closed as solved. (Graham 2009; Rambaud 2007, 79-81; Varkey etc. 2009, 52) The problem owner checks the implementation status of each action point and solution effectiveness, thus, performs an audit. The problem owner records the results and presents the results to the team. The problem owner also tries to identify similar vulnerability to the problems, so that in the future development can be directed to those points. Future actions are widely discussed with team.

Evaluation and conclusion drawing are essential part of the case study. It has to be defined, how different issues are measured and how the results are evaluated. It is important to distinguish between the several elements that are measured and evaluated in this thesis: return and reuse process, development process, research done in this thesis, the case study and the whole thesis. Most importantly it has to be evaluated whether the research questions have been answered. Evaluations are judgments about the worth, value, or effectiveness of a performance, act, or outcome of some kind of. An evaluation has six elements: criteria, terms, evaluative analysis, bottom-line judgment, qualifications, and actions. (Ellet 2007, 75-76) To perform evaluation the following issues should be considered: What are the criteria; who evaluates; when evaluation is done; what is purpose to develop? Is the purpose to develop a new, operational solution or another method of organizing? In that case, what is to be evaluated? (Anttila 2007, 95)

Step 8D is about evaluating the outcome and recognizing contributions. Results are reviewed and evaluated by the team. The development process as well as the business results are evaluated and lessons learned are written down. Recognition to the team is given. The following positive and negative aspects of the process are to be considered: what was accomplished, was the problem fixed and what benefits have been achieved, what went well and why, were the expectations fulfilled, what was not accomplished and why, what could have been done better and how, did anything go differently than expected, what should have been done differently from the beginning, what presumptions were incorrect, how did the team work, how did the problem coordinator work, what were the most valuable lessons learned, what improvements are needed in future, recommendation and comments. If in each of these points it is also considered ‘why’ the team succeeded or not, then the team is able to learn and to find a common understanding. (Graham 2009; Rambaud 2007, 87-88; Otala 2008, 253)

First in the team meeting the results are reviewed based on the audit done by problem owner. Further development is discussed. Evaluation of return and reuse process development is done by the team members in a team meeting where they are asked to fill in a questionnaire with open questions. The questionnaire consists of the above mentioned questions and also free text field is available. Filling in the questionnaire will take about 10 minutes time from the team meeting, but then the problem owner can be sure to receive feedback from each team member. The questions are only guiding so that each team member can emphasize the issues important to them. Also the team members are asked to give feedback during the team meeting.

In addition to development process evaluation, also the outcome, meaning business results, are evaluated by the team in a team meeting. Also observation, individual management interview and statistical analyses are used in the evaluation of business results. Measurements of logistics process in theory are discussed in Chapter 2.4. The results of the process measurements are presented in the case study in Chapter 4. Statistical analysis tools supplement process analysis methods by actually measuring what is happening in the process (Gourdin 2008, 268). Measurements such as monetary values, quantity and time are used. Descriptive statistics are used to demonstrate the financial values of inventory levels and inventory turnover. To all issues measured and evaluated in the return and reuse process direct numerical values are not available. Measurements in research consist of assigning numbers to empirical events in compliance with set of rules (Blumberg etc. 2008, 438). Statistics and process flowcharts are used for showing what has actually changed. In the evaluation, the process flowcharts of the current and the developed return and reuse process are compared.

Quantitative methods are used also in the case study. Secondary data, in this case financial statistics, related to the issue is available. Statistics will be used for measuring the current status and the development of the situation. Statistics will be analyzed and interpreted. The case study results will also be reviewed from statistics data. Descriptive statistics is a group of statistical methods used to summarize,

describe or display quantitative data. The data can be presented in tables, charts or in some other graphical form. Descriptive statistics is used in analysis of frequency, average and range. Descriptive statistics allows patterns to be discerned that are not apparent in the raw data (Collis & Hussey 2009, 221; Growther 2009, 180). In this case study, the descriptive statistics about financial issues, mainly about inventory values, will support the qualitative methods. The case study could have been done using only qualitative methods and based on only secondary data: financial data and statistics. These methods could have not covered all the important issues and points of views essential to the research problem. The case study does not purely lean on the qualitative methods, since they are not solely the key to solve the research problem. It must be noted that the methods used must be useful for achieving the purpose of the research.

It is important to evaluate the research done in this thesis. There are various criteria suggested by different authors. There are three concepts that provide basic frame work for the research evaluation: validity, reliability and generalization. Validity is the extent to which research findings accurately reflect the phenomena under study. Reliability relates to the absence of difference in the results if the research were repeated. Generalization refers to the extent which research findings can be extended to other cases or other settings. Evaluation of qualitative research should take place during the whole research process, not only at the end. (Collis & Hussey 2009, 335, 339, 432; Erikson & Kovalainen 2008, 291, 295)

Also the whole case study needs to be evaluated. Case studies can be evaluated on the same type of criteria as qualitative research in general, but there are also specific criteria for case studies in particular. Good case study must be significant in one way or another, issue studied should be interesting and relevant and case study must be complete. A good case study should consider alternative perspectives; both supporting and challenging evidence should be presented. (Erikson & Kovalainen 2008, 133-134)

4 CASE STUDY: DEVELOPING RETURN AND REUSE PROCESS

In this chapter the case study of thesis will be presented: developing return and reuse process in the case organization. The reverse logistics theory and research methods presented in the previous chapters will be applied to the case. The collected data, analyses, development solutions and implementation and also the outcome will be presented. This chapter will start with a short introduction of why the development project was needed and what are the risks related to the project. Secondly, the current return and reuse process is described. The pain points of the current process are pointed out. Thirdly, temporary solution is discussed. Fourthly, root cause analysis are presented. Finally, solution proposal is written and also implemented. New return and reuse process is described. The evaluation discussion is in Chapter 5.

4.1 Development project

Demand for the development project has risen from the needs of the case organization. There are case organization's internal issues and external factors are also increasing the need to develop the return and reuse process. The demand to save costs and effort has forced the case organization to do process development, meaning that also return and reuse process needs to be developed. The return and reuse process were defined as it is in the fall 2008 to the case organization. Since then some of the factors have changed or were not noted, when the process was defined, and there are some real pain points that affect the daily work. Deeper analyses are needed than just a quick facelift. Also the need for process development arises from the high pressure in the case organization; OEM business is booming, but the overall company's financial situation is not good. One factor is that the financial crisis has increased the case company's interest in the inventory values, to which return and reuse process has impacts, since money is tied up in inventories. These are the main reasons that have generated the idea for this thesis. Management and key persons supported this thesis from the beginning, because of the above mentioned reasons.

A way to look at the reverse logistics pointed out in the theoretical part is the potential and benefits that a company can get out from the reverse logistics. During year 2009 from all the OEM orders about 3% were approved to be returned. The value of the OEM items is high and thus also the total value of the returned items sums up to be relatively high. From the approved returns 20 % of the items were returned to vendors, thus also credit received for the items from the vendors. The rest of the items that could have not been returned to vendors were moved to buffer. About 30% of the returned items were moved to buffer and then reused from there. Leaving 50% of the items that were returned to buffer into buffer and waiting for reuse. To sum up, the open potential in buffer is half of everything that is approved to be returned and the value of this potential is relatively high. To get benefits from this potential there must be effective ways to reuse items from the buffer, first to new customer teams orders and secondly to sell items to outside brokers. In addition to approved returns, there are the returns which are not approved and were directly scrapped. Some items were also scrapped as they became obsolete in buffer. The value of the scrapings during year 2009 is less than one percent from the total OEM order value. These figures are calculated based on report from year 2009. These figures represent a snapshot from the year 2009. There are of course cumulative effects from previous years also, meaning in the buffer there are also items that have been moved to buffer in previous years.

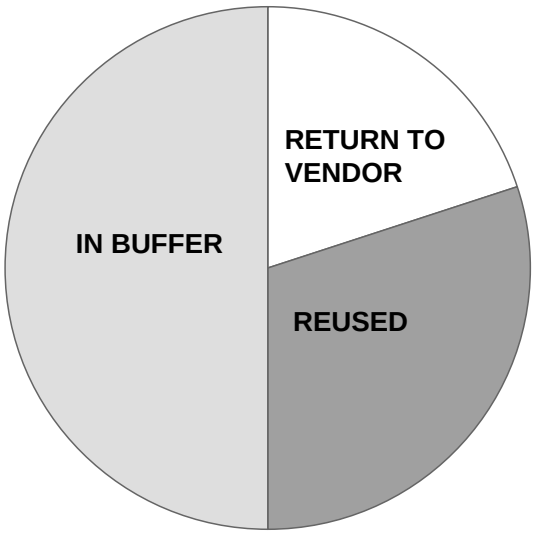

FIGURE 10. Returns of OEM HW 2009

There are some risks involved in this development project and writing a thesis about it. The risks are tried to be minimized by acknowledging them and adjusting the development project plan accordingly. A major risk relates to the resources available for the development project. The fact that this development project has no allocated resources and it is performed within normal daily business will of course affect the project. The risk about resources has been minimized by setting realistic goals to the project. The resources and expectations needs to be in line.

The key persons' participation and commitment to the development project is important, since their know-how is essential and their commitment to the new return and reuse process is needed for the process to work effectively. The key persons agree with the importance of this development project and are willing to participate, since they understand the reasons and they also see the need for the development. Nevertheless, being aware of that the commitment of the key persons is important, but on the other hand knowing that they are short on time, the researcher has taken an active role in the development project. All the major issues were discussed with the key persons and decisions were done in co-operation, but the key persons were not loaded with action points related to the development work. Researcher has tried to make it as easy as possible for the key persons to participate by taking the actions.

In addition to these case organization's internal risks, there are risks related to the case company level. Because of the financial situation of the case company, it has been informed that there will be rearrangements done. How these rearrangements will affect the case organization, has not yet been announced. The schedule of this development project can be modified, if needed once there is further information about the rearrangements. The schedule has also been set up so that the project does not last for too long. The development project will be done in realistic, but still in compact schedule. The development project will be conducted during October 2009 – May 2010. In a hectic business environment, the project development must be done within a compact time frame, so that the development project will fulfill the original needs why the project was started.

4.2 Current return and reuse process

In this chapter the current return and reuse process is described in detail. Flowchart of the current return and reuse process is presented in the below picture. The process starts when the need to return items occurs. The need can arise as a result of incorrect ordering, when the customer team realizes they have ordered something they actually do not need. Another reason for returning items is the so called risk order, where the end customer deal fails and the items are not needed. First step is that the customer team sends the return form to the return coordinator.

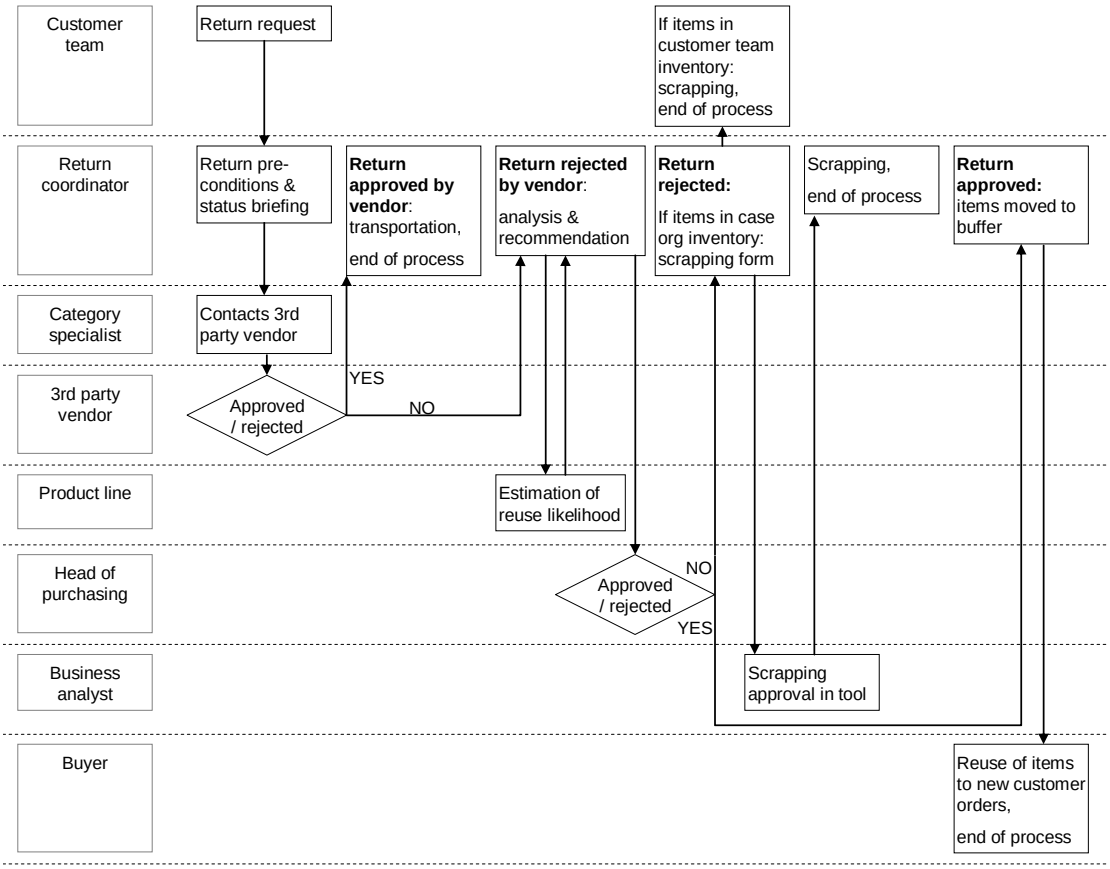

FIGURE 11. Current return and reuse process

Return coordinator receives the return request by e-mail with the return form as an attachment. Return coordinator verifies that mandatory information is filled in to the form and that the conditions for return are fulfilled, meaning that items are in unopened original boxes. Return coordinator checks the order status from the system and also verifies the physical location of the items. Once the return coordinator has checked the facts, that the case is qualified to return process, (s)he takes a return form number from the return follow-up and fills in basic data about the case. The return number is a running number that identifies each return case. Return number is informed to the customer team.

Return coordinator writes a briefing and sends it to the correct category specialist depending on the third party vendor involved. Category specialists are a part of the same organization as the buyers. Category specialist's task is to manage certain vendors, thus category specialist does not purchase items like buyers. Category specialist contacts the third party vendor and asks for return permission. It is agreed with some category specialist that return coordinator will contact the vendor directly. There can be several third party vendors involved and thus several category specialists involved. Depending on the acceptance or rejection of the return request by third party vendor, the case will proceed.

If the third party vendor approves the return request, category specialist forwards the approval together with the practical return instructions from the vendor to return coordinator. Return coordinator informs the customer team, that the return has been approved. Depending on the ordering system return steps are performed in the system either solely by the return coordinator or partly by the customer team in guidance of the return coordinator and continued by the return coordinator. More and more the customer teams are shifting to an ordering system in which returns in the system are partly done by customer teams. The last step in the system is done by the buyer in a case where items are returned to a vendor. Return coordinator makes sure that the physical material is either made available to the vendor to pick-up from the warehouse or arranges the shipping to the vendor's premises depending on the

agreement with vendor. Once return in system and also the physical movement of the items is performed, return coordinator closes the case in return follow-up and saves the return form to a certain archive folder. At this point it also has to be noted, that there can be several vendor involved, thus the case is closed only when all the items involved in the case are handled.

If the third party vendor rejects the return request, category specialist informs the rejection decision to the return coordinator. Return coordinator then creates a briefing from the case and sends it by e-mail to product line or business unit contact. Product line is responsible for the product solution over its lifecycle. Business unit is responsible for competitiveness and profitability of the product. Business unit or product line contact can be found from the contact list or then category specialist tells the return coordinator the correct contact. Return coordinator asks the product line or business unit contact to evaluate, if there is over a 50% probability that a need for the items will arise in next six months. In other words, is there over a 50% probability that a new customer order will be placed in next six months for which the items could be used. The criteria, probability percentage 50 %, are defined by the case company finance and controlling. In the e-mail it is also pointed out that the opinion of the business unit or product line contact is needed and essential. Depending on the feedback from the product line or business unit contacts feedback, the return coordinator creates a summary and recommendation. Recommendation can include either an approval of the return, meaning approval to move the items to buffer, or rejection of the return, meaning scrapping. Return coordinator sends the summary and recommendation of approval or rejection to the head of purchasing, who gives the formal desicion. Usually the head of purchasing follows the return coordinators' recommendation.

If the decision has been approved, return coordinator informs the decision to the customer team. Depending on the ordering system, return steps are performed in the system either solely by the return coordinator or partly by the customer team in guidance of the return coordinator and finished by the return coordinator. Return coordinator informs the warehouse that the items are moved to buffer. The warehouse updates the buffer list and sends the updated list to the buyers. Once the return is in the system and the warehouse has been informed, return coordinator closes the case in return follow-up and saves the return form to a certain archive folder. Again, this is done only if all the items involved in the case are handled.

If the decision has been return rejected, return coordinator informs the rejection decision to the customer team. Rejected return decision means that the items are to be scrapped. Depending on the status of the order in system, the scrapping is performed either by the customer team or by the case organization. If the items are in the customer team's inventory, the customer team handles the scrapping. If the items are in the case organization's inventory, they will perform the scrapping in the system. Depending on the value of the order, the case organization might still need to ask for approval from the customer team in order to be able to do the scrapping.

In practice, once the return coordinator receives the rejection decision and the order is in case organization inventory, the return coordinator fills in a scrapping form and sends it to business analyst in finance and control. Business analyst inserts the items to an approval tool and sends the scrapping request forward in the tool. Depending on the total value of the items, the scrapping request needs to be approved by different managers in the tool. If the value is high enough, also the customer team managers need~~s~~ to approve the scrapping request in the tool. Once all the approvals in the tool are received, business analyst sends the scrapping request back to return coordinator with codes which are needed to perform the scrapping in the system. Return coordinator performs the scrapping in system. Return coordinator contacts category specialist, product line and business unit contacts and asks if any of the company's internal laboratories are interested in the scrapped items. Laboratory can receive the

items free of charge with cost of transportation, usually from warehouse to laboratory. This is done in order to avoid sending items to the toxic waste disposal plant. Once an interested laboratory is found, the return coordinator arranges the transportation from the warehouse to the lab. After it has been informed to the customer team that it is their responsibility to do scrapping or return coordinator has performed the scrapping in system and physical relocation or actual physical scrapping is done, return coordinator closes the case in return follow-up and saves the return form to a certain archive folder. Again, this is only done, if all the items involved in the case are handled.

If the items are approved to be returned, although vendor does not take the items back, they are moved to buffer. All the items, which are moved to buffer, are marked to so called buffer list. Logistics coordinators release the customer team orders to buyers. Once the buyer receives an order, (s)he will first check from the buffer list, if there are items available in the buffer, before creating a new purchase order to third party vendor. If there are no suitable items available in the buffer list the buyer will create a purchase order to third party vendor and then the vendor delivers the items as agreed. If there are suitable items available in the buffer, then the buyer will not create the purchase order to vendor, instead the items are used from the buffer. Permission and assistance of the customer team is needed for the use of items from buffer, since a small modification needs to be done to the order so that system it is possible to continue the delivery process from the buffer. It is also possible within the same order to use some items from the buffer and purchase some items from the third party vendor. However, it has to be noted that the complex nature of the items makes this difficult and complicated. Items might be integrated and packed together.

4.3 Pain points and problems in the current process

The pain points are presented in chronological order in the following flow chart together with the current process flow chart. First, in this chapter the pain points and problems in return and reuse process are presented. The purpose is to state: what should be developed and where in the process, but no development proposals are given yet. Then, general development categories are introduced. These development categories sum up the detailed problems. Finally in this chapter, problem statement is formed and linked to the research question of this thesis.

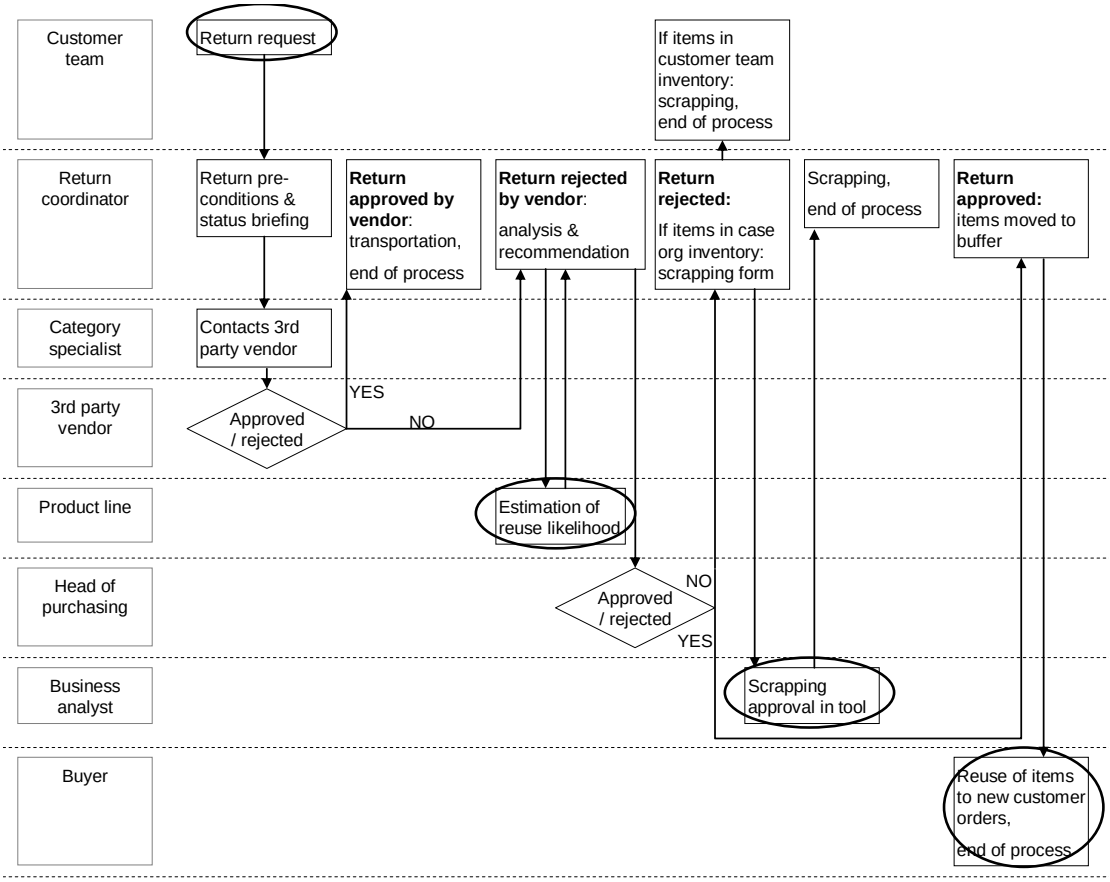

FIGURE 12. Pain points of the current return and reuse process

The return process, return form and steps in system are not well known to the customer teams. Customer teams need a lot of instructions and guidance in the process. Customer teams do not know what the return form is and how to fill it in. Many customer teams are shifting to an ordering system, where part of the return in system is done in customer teams, if the return is approved. The customer team needs to create the return sales order in the system ones return is approved and the customer teams do not know how to do it. There is a lack of competence in the customer teams in system skills and also in process knowledge.

The biggest problem return process is the decision making stage. If the vendor does not approve the return, product line or business unit is contacted for their estimation of the reuse probability. It is difficulties to get information, or the information is not precise, from business unit or product line about the demand for the items in the next six months, which makes the decision making for approval or rejection difficult. Facts for the decision making are missing. Thus, it is difficult to recommend either scrapping or approval and make a final decision based on recommendation.

Reuse process over all is heavy and time consuming. The buyers do not have time to seek for reuse possibilities in their daily work. The process for checking, if there are suitable items in buffer, is totally manual based on Excel document and not supported by system. The buyers are loaded with work due to the booming business and they do not have time to check the buffer list when purchasing the items. Currently other organizations, like product support, product line, business unit and order engineering, are not actively participating in seeking for reuse possibilities. Customer teams do not take any responsibility for the returned items. Customer teams are not seeking for reuse possibilities in their own orders.

Even if the buyer, would find a potential new order, to which items could be used from buffer, it is time consuming and difficult to get practical product support. Warehouse and product support, product line or business unit must be consulted to find out, if the items really are suitable for the new order. The purpose of product support team is to ensure efficient support for order configuration throughout product's lifecycle. There is no one contact engineer that would have the practical product knowledge. There are many obstacles in practice caused by the technical nature of the items. It’s not necessary possible to use individual item to new orders, but instead the whole package needs to be used as set. The integration done to the items by the third party vendor before packing may cost problems in practice. It is mandatory that the items are in their original packing with original seals. Also in the system the business units have different item codes in use although the content is the same.

Although, the buyer would have spotted a new order to which items from buffer could be used, and the suitability of the item would have been confirmed, the customer teams are not willing to use items from buffer. Approval and co-operations of the customer team is needed to use items from buffer. Buyers are pressured from customer teams to create new vendor purchase orders to the orders. If the customer team approves the usage of buffer items, it is still hard to get customer team logistics coordinator to do small modification of item categories in the order, which able in system the use of buffer items.

The flow of the items is not transparent between return and reuse process. It is totally manual process to monitor what there is in buffer. The buffer list and the inventory follow-up are in several excel sheets and they are not always up-to-date. The buyers do not have any visibility to items in the return process. Some reuse possibilities might be lost, because items are not yet visible in the buffer list. There is no schedule or action plan for the items in the buffer and there is no history information about the items in buffer. During inventory and obsolete and excess analysis time is spend for figuring out, why something has been moved to buffer and what are the next actions

for that item. The items get old and are not any more usable, thus they turn to be obsolete. Scrapping is the final step to clean buffer. There is no process for selling to labs for research and development purposes or to some external broker with reduced price.

In scrapping the biggest problem is that customer teams are not aware of the costs that may occur. Customer teams do not understand that all the items can not be automatically returned and if there is a rejection decision it means the items will be scrapped in their cost. Customer teams do not either understand, that they might have to bear the scrapping costs later; if the items have been moved to buffer, but not used, the scrapping is done in cost of customer team. Depending on the value of the order the case organization might still need to ask for customer team's managers approval in the scrapping tool in able to perform the scrapping. It is time consuming to find the correct person from customer team side that approves the scrapping in a scrapping tool, which is mandatory by finance and control requirements. Scrapping request is not always approved by the customer team or they ignore the request in the scrapping tool. Scrapping should be done in the cost of customer team, but in some old cases, where items have stayed in buffer for long time, it is not possible to track down the customer team. In some cases the approval of business unit or product line is also required and they do not approve scrapping of the valid items from the buffer, even if the items have been there for long time.

Development topics

The return and reuse process and the pain points and problems have now been described. Form these presented pain points and problems six general development categories were summed up: facts for decision making, active participation of the business unit, product line, customer teams for seeking reuse possibilities, improve transparency, practical product support, customer teams co-operation and awareness about costs, and process for selling in reduced price. The purpose to combine the detailed pain points and problems under common category was to tackle the pain

points and problems in process level, not only in detail level. These general development categories represent the issues that need to be changed or improved most importantly. Later on in this thesis, the meaning of these six general development categories will be explained, they will be analyzed, given solution proposals and proposals will be implemented to improve the return and reuse process.

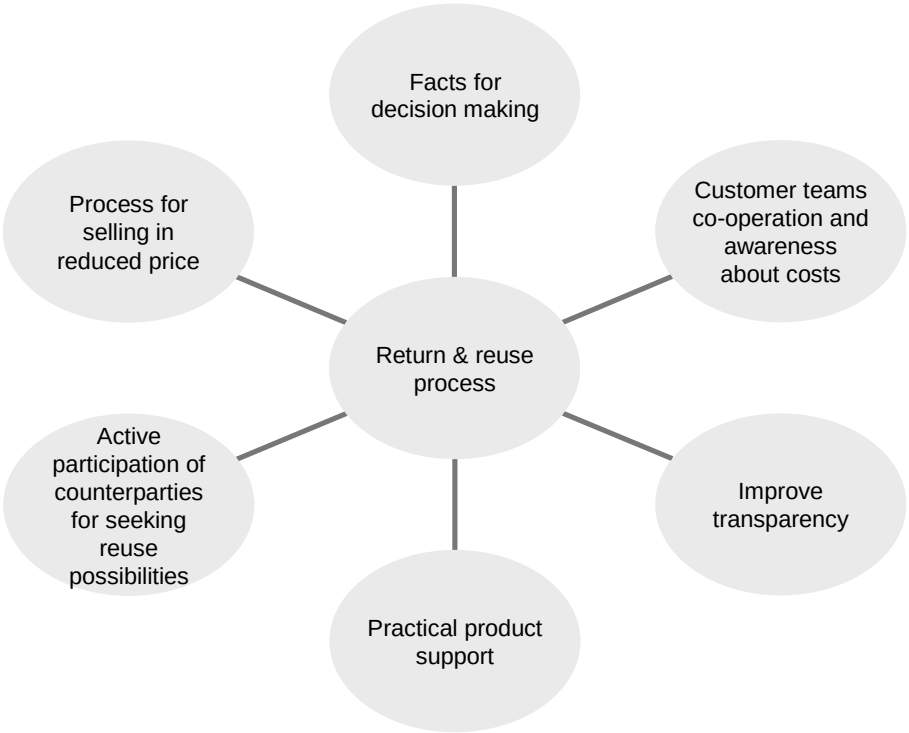

FIGURE 13. Development needed for return and reuse process

To ensure that all the key persons' points of view were taken in to consideration when forming the six development categories, the key persons were asked to vote the most important development category from their perspective. The customer teams' co-operation and awareness about costs category received two votes. Facts for decision making; improve transparency; and active participation of counterparties for seeking reuse possibilities categories received each one vote. Remaining two categories, practical product support and process for selling in reduced price, were also agreed to be important. The spread of the votes illustrates the complexity of the issue and the different views that there depending on the position of the person in the process.

The research question of this thesis is: what is the optimal reverse logistics process? Meaning what is the most desirable way for the process to function. All in all, the key persons, researcher being one of them, would like that the return and reuse process would function effectively and smoothly in practice and would minimize the costs to the case organization and to the case company. Problem statement was defined: the process should work effectively and smoothly and give results that would in decrease the over all costs. Effectively in this context can be defined as a practical way that it causes a strong and intended result. Smoothly means in this context process that flows free of delays, obstacles and difficulties. Additional hope is, that the opportunities and benefits created by the return and reuse process would be also understood and it should also be learned how to use these opportunities and benefit.

4.4 Temporary solution

The development category: facts for decision making, was selected to be used in temporary solution stage, since the problem occurs in the beginning of the return and reuse process and slows down the whole process. Temporary solution can of course also be turned into permanent solution, if the results are good. The idea before the meeting with order engineering logistics manager and order engineering specialist was to find out how order engineering could help and support in the return and reuse process. Specifically how order engineering could help with the development category: facts for decision making. Order engineering is part of the case organization and it provides product specific technical and logistical support to customer teams for complex OEM orders. Order engineering is in contact with the selected customer teams ordering certain products under order engineering scope and supports the customer teams in the process of placing the orders and in the orders' time line planning. The idea to use order engineering support was generated by the case organization management with the purpose to use the resources and opportunities available in the case organization.

It was found out in the meeting with order engineering logistics manager and order engineering specialist that order engineering reports do not help in the problems related to return process decision making and the facts needed for that. The main finding was that order engineering does not have the possibility to provide information about the likelihood of the demand for the items for the upcoming half-year period. The main issue is that order engineering team is not able to forecast demand in detail, since their forecasts are not on item level, but bigger planning items are used. The order engineering receives only some forecasts that reflect the demand to only certain main planning items, not all items are in the scope.

It was, however, discovered that in buffer reuse process order engineering could help. Order engineering is in contact with some of the customer teams at the stage when they start to plan the ordering. Order engineering could suggest the customer teams to use items from the buffer, if suitable items are available. The best possible situation would be that when the buyers receive a new order they would also receive information that it has already been agreed with the customer teams that some items are to be used from the buffer. An advantage to customer teams of using items from the buffer is a short lead time, and of course advantage to the case company is cost saving when scrapping is avoided.

It was agreed that when order engineering specialist receives configuration files, which are files that include the items that the customer team is ordering, for checking (s)he checks from the buffer list if there are matching items and then communicates with product support and warehouse whether the material is suitable. The suitability is determined by the configuration, possible integrations done to the item and the packaging. Order engineering specialist participating in this meeting is responsible for Middle East and West South Europe areas. It was agreed that the rest of the order engineering specialists responsible for other areas should be advised to start sending configuration files also to this particular order engineering specialist for checking the possibility to use items from the buffer. It was also agreed to start with a few ongoing

return cases and see if the items could be reused to the new orders which order engineering specialist was at that time supporting.

The practical problems with the use of the buffer list were discussed. The buffer list should be more accurate: obsolete items should be removed, buffer list should show how the items are packaged, correct sales order and purchase order numbers should be mentioned. It is frustrating for order engineering specialist to work with list that has obsolete items. The buffer list needs to be modified so that it is clearly marked how the items are packaged; which items are one physical package with seals on it. In addition to this meeting, the order engineering logistics manager and order engineering specialist and return coordinator visited the warehouse so that the order engineering, that has not visited the warehouse earlier, would get an understanding from the practical issues like packaging.

To sum up the discoveries: order engineering reports do not help in forecasting the demand for items in return process, and order engineering could help in reuse process, if the practical issues would be sorted out and support in this. Due to the difficulties in the practical issues no reuse cases happened based on the cooperation with the order engineering at this point.

4.5 Root cause analysis

In this chapter, the root cause analysis are presented. First, the six general development categories are studied based on 5 Whys analyses with the purpose to uncover a deeper level of contributing cause. 5 Whys analyses is illustrated in the below picture. Secondly, it is demonstrated with step-by-step cause-effect diagram how the different factors cause return and reuse process to be inefficient. Finally, the relationships between the development categories are studied with the interrelationship diagram. In this chapter, no development proposals are given yet, only the causes are identified. The causes discussed in this chapter are versatile. Discussion about the causes has been lively and different perspectives have been considered.

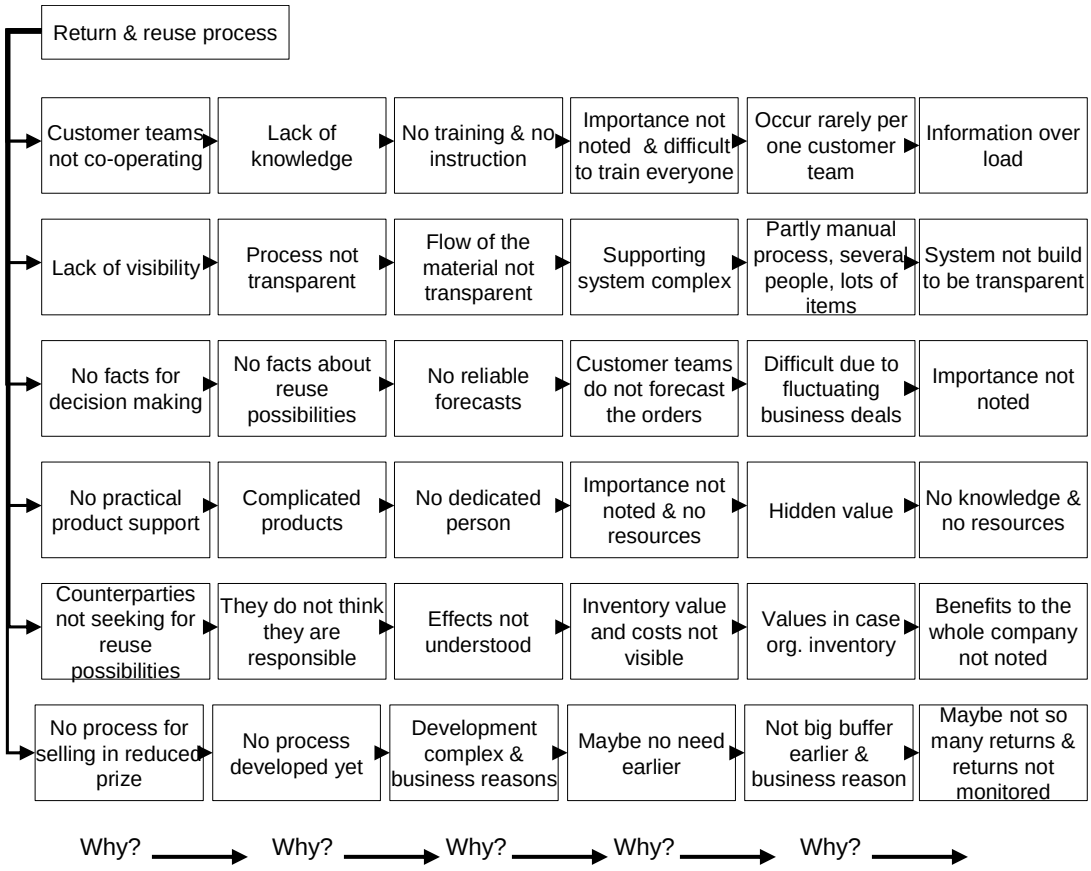

FIGURE 14. 5 Whys analysis of return and reuse process

The problem that there are no facts for decision making in return process was briefly covered already when seeking for temporary solution in previous chapter. But still further analysis is needed. There are no facts about possible reuse possibilities available. Currently it is estimated if there is over 50% likelihood that items can be reused in the next six moths. The criteria, likelihood percentage 50 %, are defined by the case company finance and controlling. This estimation is difficult to be made with current available information. There are no reliable forecasts available, since customer teams do not forecast the orders at all or at least the forecasts are not done on item level. Customer teams are not sure about the business deals and about what they will order. General forecast with planning items does not help in this case, since it would need to be known if the specific items and versions of the items could be used from the buffer to new orders. There are no facts or reliable forecast on item level available about possible reuse possibilities for decision making, since adequate forecasting is not done at all or not done at least on item level. This can be due to a several facts, such as forecasting in item level is difficult in changing business environment or forecasting in item level has not been considered important.

Customer teams are not co-operating in return and reuse process. None of them is aware of the costs related to the process. This is due to the fact that customer teams do not understand the nature of the OEM business and obsolete risk related to returns. Customer teams have not been trained enough and for many issues there is no OEM specific instruction available. Return process is one of these areas where there are no OEM specific instructions available. OEM business is growing fast and in the past it has not been noted to be so important that there would have been trainings and instructions specifically about OEM related topics. On the other hand it might be impossible to train people about OEM business, especially returns, since the returns occur so rarely per one customer team person that they will forget the information. There is a lot of customer teams and logistics coordinators located all around the world. There is so much information available about different things that people are overloaded with information.

Since customer teams are not aware of the nature of OEM business, they are not either aware of the costs and obsolete risk related to the return process. It is time consuming for the business analyst to find out the approval chain of scrapping in each customer team. Since the customer team managers do not understand why the customer team needs to bear the scrapping cost, it makes the scrapping approval in the scrapping tool difficult. The customer teams do not understand that if they order something they might have to pay for the items. There is no absolute return right in OEM business. Customer teams do not fully understand the nature of the OEM business and are not aware of the obsolete risk related to returns, thus customer teams not co-operating and not aware about the costs.

During root cause analysis one important topic concerning scrapping and thus the layout of the whole return and reuse process was investigated. One important topic related to finding optimal return and reuse process is the question: of whether the case organization has the right to scrap items from the buffer in customer teams' account. This affects the choice of how easily and with what kind of criteria the items can be moved to buffer. If the scrapping from the buffer is not allowed at the cost of customer teams, then it must be really strict what will be approved to the buffer, since then the possibility to do the scrapping at the cost of customer team is lost. If the scrapping at the cost of customer teams is possible from the buffer, then the criteria can be looser and items can be approved to buffer and scrapped from there at the cost of customer teams if no need occurred. It was decided by finance and controlling that the case organization has the right to do scrapping at the cost of customer teams from buffer. This was also now written to the scrapping rules.

Business unit, product line, product support and customer teams, also referred as counterparties, are not actively seeking for reuse possibilities. The whole responsibility is shifted to buyers. The counterparties do not think they are responsible for the items and the costs. They do not think about the benefits to the whole company which there are from using the items from buffer, like lower inventory, no need to do scrapping, short lead times for products etc. The counterparties do not see the values of the items in their inventory or costs, since the

values are in case organization inventory values. This does not mean that this would not be the whole case company's problem and reuse would benefit the whole company. It has to be understood that if scrapping is done, it also has an effect on the results of the business unit. Counterparties are not actively seeking for reuse possibilities, since they do not see the cost effects and also potential benefits, since the items are in case organization's inventories. Case organization's counterparties need to be involved in the process and seek for their active participation by informing them about cost effects. Material ownership of the anonymous materials is in the case organization but it is in counterparties own interest to participate actively.

Lack of visibility is a problem in overall return and reuse process. The flow of the material is not transparent in the process. The buyers have no visibility to items which are not yet moved to buffer and the return coordinator loses the view once items are moved to buffer. The system supporting the process is really complex. The process is manual for many parts. Several people are involved and a lot of orders and items flow through it. Also other people than just the case organization members have access rights, and from time to time it is found out that customer teams are returning items without permission. The system has not been built up to be transparent and allow several users to access the data. If manual mistakes happen, it is difficult to spot them. There is lack of visibility in the return and reuse process, since the current way of working is manual, complex and not transparent.

The buyers do not have practical product support for using the items from buffer available although they would need it. The items and configurations are complex and the buyers do not always know if the item is suitable for the new customer order or not. The complexity of the products is difficult to master by one person and there is no one competent person dedicated to this issue. The importance of this issue is not noted or the importance is noted, but there are no resources. There is a lot of hidden value and opportunities in the buffer, which the case organization is not able to fully use. There is not practical product knowledge and even if there is a person with practical product knowledge, their time is not allocated to this issue, thus no resources to support the buyers.

Currently there is no process for selling in reduced price items from buffer. Development of such a process is complex and there might not be adequate business reasons for reserving budget for required system development. Earlier there might have not been demand for the process maybe do to lover buffer value, business decision not to seek for selling in reduced price, not so many returns or the returns were not monitored so well. In the future there might be demand for such a process. The business case needs to be evaluated carefully, if there is a business case to start system development. It has to be also considered what the benefits for laboratories versus business case are. Currently the laboratories get the items free of charge after scrapping is performed. Now, if case organization would start selling the items in reduced prices to some outside broker, the laboratories would lose the free items. Then the laboratories would need to purchase the items with full price from third party vendors. In addition to donating for laboratories, there might also be a need for the process of selling in reduced price since the OEM business is growing and more items end up to buffer especially if it chosen that the criteria for taking items to buffer are not so strict. There needs to be an effective way of getting the old items away from buffer and one of these ways could be selling in reduced price to broker.

Now, the root causes of the development categories have been discussed. With step-by-step cause-effect diagram the presented analysis of the development categories are summed up showing the root causes for ineffective return and reuse process.

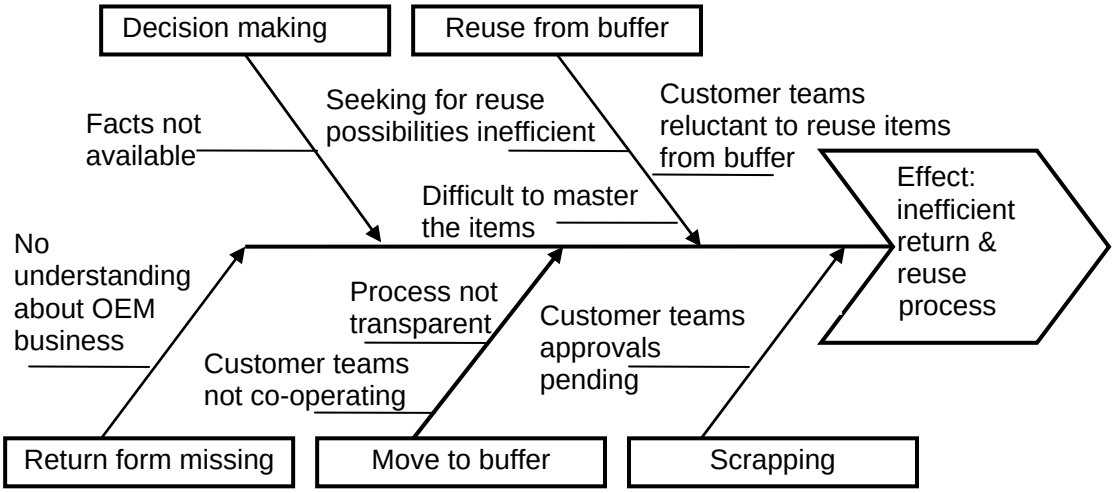

FIGURE 15. Cause-effect diagram of inefficient return and reuse process

The relationships between the development categories and influence on the overall return and reuse process are studied by interrelationship diagram. As illustrates by the picture the factors are interrelated and there are complicated and critical linkages between them. The reading of the picture can be started at any point. Between the development categories related to each others there is an arrow pointing from cause to effect to show the relationship. Related to inefficient return and reuse process the two important factors, with many outgoing arrows, are: customer teams' co-operation and awareness of costs and practical product support. Related to inefficient return and reuse process the two bottlenecks, with many arrows pointing to, are: facts for decision making and move and reuse from buffer. The problems of the whole process become visible in the bottlenecks.

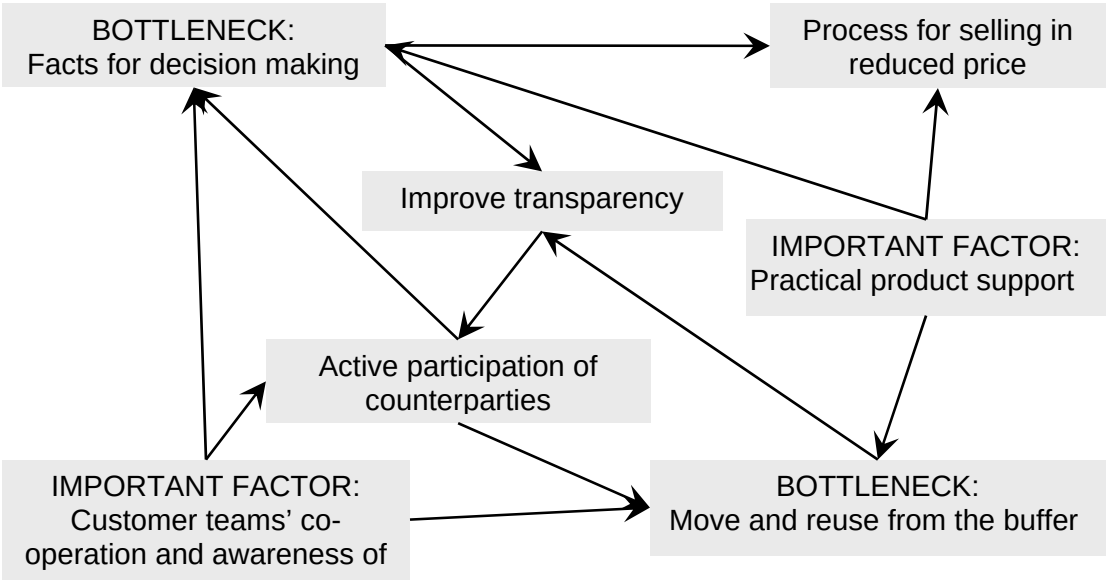

FIGURE 16. Interrelationship diagram of development categories

4.6 Development solutions

In this chapter the short and long term development plans are presented. In order to develop the return and reuse process, the following development categories are addressed with a short and/or long term development plan: facts for decision making; customer teams co-operation and awareness about costs; improve transparency; active participation of counterparties for seeking reuse possibilities; practical product support; and process for selling in reduced price. The root causes identified to the development categories in the previous chapter will be addressed in the development plans. While addressing the root causes business realities and limitations of this thesis are considered. When determining the next short term steps, which are in scope of this thesis, it is important to determine who and when. The problem owner will monitor the progress of the development plan and the possible problems occurred are discussed with team members. The solution description is in the below table 1.

TABLE 1. Development plan

Task	Responsible	Schedule	Status	Audit check
Up-to-date business unit, product line and product support contact list and send the contacts an information package	Problem owner	Short term	Done	x
Create and publish return & reuse instructions	Problem owner	Short term	Done	x
Modify and update buffer list	Problem owner and key user of buyers	Short term	Done	x
Combine internal process steps	Problem owner and key user of buyers	Short term	Done	x
Distributing updated buffer list to counterparties	Problem owner	Short term (regularly: long term)	Done	x
Build up product support network	Problem owner	Long term	In progress	x
System to support the process	Problem owner	Long term	In progress	x
Process for selling in reduced prize	Controller	Long term	In progress	x
Combine risk, return and scrap approval processes	Problem owner, controller	Long term	In progress	x

Approval policy and process instructions

Gatekeeping is a key management element in reverse logistics that determines which items are allowed to enter the return process and when. Problem is that there are no facts or reliable forecasts on item level available about reuse possibilities for decision making. In theory it has been pointed out that forecasting is essential. Pinpointing the need and emphasizing the importance of accurate, detailed forecasting are the first steps to raise discussion about changes needed in this area. The case company should consider benefits of accurate item level forecasting.

But for now, gatekeeping stage should be speeded up, so that return cases would not need to wait for the approval or rejection decision too long. As stated in the theory, time is essential when there is possibility to resale. The focus should be turned to seeking reuse possibilities, instead of gatekeeping. The return coordinator will from now on check from the system what the material status of the items is and have there been any movements of these items during the past half a year. Material status is a number that tells if the item is in ramp-up, normal usage or ramp-down stage. At the ramp-down stage item turns obsolete and customer teams do not order it anymore. Return coordinator will also ask for product lines', business unit's or product support's opinion about the likelihood of reuse in the next half a year. It has been pointed out that if they do not reply, the decision will be made only based on system data. Return coordinator will send mail to product line and business unit and product support contact and asking them to give up-dated contacts to the OEM return and reuse contact list and according to received feedback update the contact list for OEM return cases.

When material status is started to be used in the return process as one indicator, the return coordinator needs to first remind the product structure team which updates this information about the importance that the material status data is up-to-date. Product structure team must consider when it is the right time to change the material status to be obsolete, since on other hand the product life cycle should be followed and on the other hand nothing should be in stock when items are moved to be obsolete, since it means that the items in stock cannot be used and need to be scrapped.

The biggest change in the gate keeping's decision making process is that from now on it is possible to approve items to be moved to buffer for limited amount of time, six months. The controller together with her finance and controlling colleagues have now discussed the scrapping instructions and also wrote to those instructions that the case organization has right to do scrapping at the cost of the customer team from the buffer. This has been unclear in the past. A clear statement in the scrapping instructions has now made it possible to approve the items to buffer for six months and hold the right to do scrapping at the cost of customer teams. If the items have not been used from buffer in six months and there are no reuse possibilities in the near future, the scrapping at the cost of customer team will be performed. In order that the six months time can be monitored, the buffer list needs to be modified and the date the items are moved to buffer is marked down to the list. This releases some of the pressure from gatekeeping stage and speeds up the decision making process. There is no need to worry so much about whether the decision is done based on probability to use the items wrong. Now the approach is more based on seeing what happens and are the items really reused or not. More effort can be put to seeking for reuse possibilities.

This change in approval policy demands that it is communicated to the customer teams. Customer teams are informed about process in the beginning of each return case and customer teams are also asked to mark the names of the scrapping approvals from customer team side to the return form. When the approval decision will be sent to customer teams it is written that the case organization still holds the right to do scrapping at the cost of customer team, if the items are not reused. This statement is also written to the return form. Return coordinator will create return instructions to the customer teams and they will be published in the intranet return pages, distributed through logistics coordinators to the customer teams, and also give to each customer team that would like to return something.

These instructions are also related to the problem that customer teams do not fully understand the nature of the OEM business and are not aware of the obsolete risk related to returns, thus customer teams are not co-operating and are not aware of the costs. As stated in the theory, the clear rules are extremely important. The clear rules indicate the roles and responsibilities of involved parties and the consequences of actions, which improves the effectiveness of the process. As stated already in the root cause analysis the information overload in the case company is huge and there are a lot of customer teams around the world and naturally the logistics coordinators working in the customer teams' change from time to time. One customer team logistics coordinator faces a return case really rarely. So training all the customer teams about the OEM return process which is to them a minor and complicated process is not realistic. Instead some of the case organizations return coordinators' working time is allocated to instruct the customer teams when they have a return case. Also depending on the situation the problem owner can arrange training to some specific customer teams. OEM specific return instructions are needed also, because the general return instructions are not easy to read for people familiar with the process. As stated already, return coordinator creates return instructions to the customer teams and they will be published in the intranet return pages, distributed through logistics coordinators, and given to customer team every time they would like to start return process.

To decrease the complexity and combine some case organizations internal steps done by different parties in return and reuse process, it was agreed that the return coordinator will from now on contact those 3rd party vendors directly to which items are regularly returned as per contractual terms and also the return coordinator will do the vendor return purchase order steps is system to all of the returns where items are returned to vendor. No need to involve category specialist for asking return permission form the 3rd party vendors when return right is stated in the contract. Vendors are informed about new contact person for returns. Vendor return purchase orders which were previously done by the buyer are now done by return coordinator while performing other related steps in the system. Vendor return purchase order in system is necessary to complete the process when items are returned to the vendor. The return coordinator, problem owner, will get the instructions how to create the vendor return purchase orders from the buyers and also ask buyer key user to open a purchasing croup, so that return coordinator is able to create the vendor return purchase orders' in her own name in system.

Seeking for reuse possibilities

Now, when the approval of the items to buffer will happen for limited time period and the focus is turned to seeking for reuse possibilities, it has to be made sure that everything possible is done so that the items would be reused. The problem is that business unit, product line, order support and customer teams are not actively seeking for reuse possibilities, since they do not see the cost effects and also potential benefits of the returns, since the items are in case organizations inventories. Material ownership of the anonymous materials is in the case organization, but it is in the counterparties own interest to participate actively. If items are scrapped from case organizations inventories, it will be done at the cost of the customer team and it will have also cost effect on business unit level. Once the counterparties are aware and understand this, they will be more willing to help in seeking for reuse possibilities.

Case organizations counterparties will be involved in the process and seek for their active participation by informing them about cost effects. For the counterparties to be able to seek for the reuse possibilities they would have to have an up-to-date list of the items in buffer. Next step is that the buffer list is modified to also serve the product lines and business units by adding information such as: valid case company's item codes from system instead of some codes of 3rd party vendors; material status; global invoicing codes to help them to identify the available products; time the items have been moved to buffer, etc. Once the buffer list is modified, so list is easy to read and all the data is accurate, and also checked in the next inventory in April 2010 that the items in the list are really available also physically, the plan is to publish the buffer list in internal document management system and start distributing the link to buffer list regularly to counterparties with related instructions. The counterparties are expected to participate in seeking for reuse possibilities, but for them to be able to do it they must be provided with tools to support this work, thus they at least need to be told what items there are in the buffer.

There is a real practical challenge with the following problem: no practical product support for using items from buffer, since no competent person dedicated. The case organization is not able to reuse the items without adequate support from the business unit and product line and order support. There is a need to build up product line support network. The buyers must get support immediately once a reuse case occurs. The steps to develop such a network are up-to-date list of business unit and product line and order support contacts for OEM return and reuse cases, define the first contact point and define the way of communicating.

Support for the return and reuse process

The problem, lack of visibility in the return and reuse process, since the current way of working is manual, complex and not transparent relates to the difficulties of mastering the overall process. This problem also relates to the difficulties that the buyers have when they are expected to seek for reuse possibilities. As already stated in the root cause analysis, it cannot be expected that only the buyers seek for the reuse possibilities and also the current system does not support the buyer in this task in any way. In the long term, the system should support the buyers in the reuse and the system development would also increase the visibility of the process. In the short term, the problem, lack of visibility in the return and reuse process, can be improved by updating the buffer list in next inventory and modifying the layout.

Technical system development is long development. The technical proposal is inserted in internal global idea management tool by the problem owner. The approval and the development of the technical solution are not in the scope of this thesis. First of all, the technical solution could already include a notification to the customer teams that when they are creating the order, some specific item could be found from buffer. The most important thing is that the system would give a notification to the buyers of an item that is available in the buffer, when they are about to purchase something from the 3rd party vendor. In the system there should be no purchase request creation for the items which are in the buffer, instead a notification for the buyer to check the suitability of the buffer item before vendor purchase order creation. In order for this notification to work, it would require that there is a separate stock for buffer items which really are physically in the buffer and available for reuse. This separate stock should have limited access rights to move items to this stock, so that items would really be physically available and meant to be reused and there would be no confusion with virtual i.e. order correction returns and no one would of the process be moving anything to this separate stock.

Approving items to buffer for certain time period, will speed up the inventory turnover and result a situation that after some time there is a lot of item that would have to be scraped from buffer as now on the items are not just left to buffer lying. For this reason case organization needs effective ways of moving not wanted and items without possibility to reuse away from buffer effectively. One way to do it is scrapping and then getting rid of the physical items by sending them to toxic waste disposal plant or donating them to some case company's laboratory. An alternative that has been discussed during and even before this development project is selling to an outside broker. The problem is that there is no process for selling in reduced prize. Case organizations controlled has found out about the different alternatives and the controller will arrange a meeting to view the different system alternatives that there are about the process for selling in reduced price.

To sum up the essential issue of this development plan is to turn the focus on the seeking for reuse possibilities. The gate keeping is needed, but if no information from product line business unit is received the decision can be also based on the information available in the system; material status and material movements during past six months. If items are not used and no reuse possibilities are in near future, the scrapping is performed in cost of customer team. Involve the case organizations counterparties to the process by informing them what materials are available in the buffer, giving then instructions how they can help in reusing the items, and also explaining to them the process and why it is in their best interest to participate. And to raise the awareness of customer teams' about risks related to returns with clear instructions which are easily accessible. As a short term improvement to the approval policy of scrapping it was written to the instructions that name of the scrap approvers in customer team has to be written in return form. The long term improvement related to this issue was not covered in this chapter. It will be discussed in the chapter 5.2 with proposals future developments. The idea would be to combine risk order, return and scrap approval processes.

New return and reuse process flow

The development proposals presented in this chapter were discussed with the team members and management with the case organization. The approval to proceed to the implementation stage was given by the management. The below process flow chart presents the return and reuse process now taken in to use.

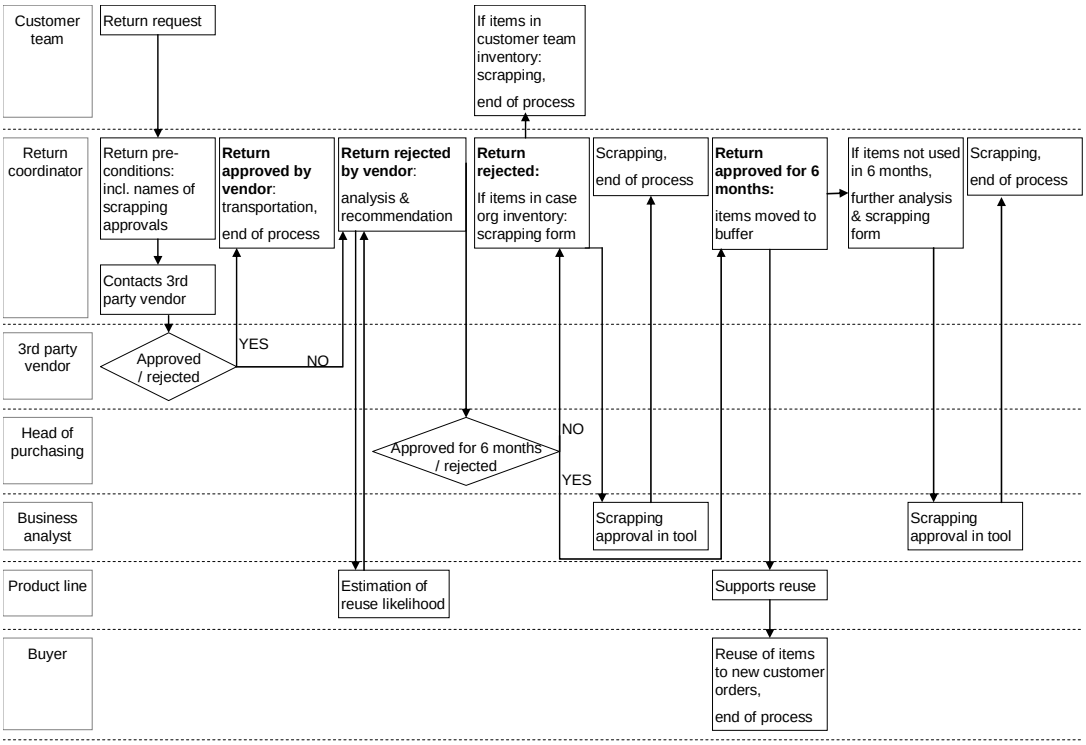

FIGURE 17. New return and reuse process

If the original return and reuse process presented in the figure 11 is compared with the new return and reuse process presented in the figure 17, major changes in the process flow can be found. In the new process already at the stage when the customer team presents a return request, they are asked to include to the return form the names of the scrapping approvals. Earlier business analyst had difficulties trying to find out the names of the scrapping approvals at the end of the process. With the 3rd party vendors to which items are regularly returned as per contractual terms, it has been

agreed that return coordinator will now contact the 3rd party vendors directly. No need to involve the category specialist and this saves time. Product line and business unit contact are still asked to estimate, if the reuse likelihood of the items in question is over 50 % in next 6 months for new customer orders, but if no estimation received the return coordinator can also base the recommendation to the material status of the item. Now, if the items are approved to be moved to buffer, it happens for limited time, 6 months. Customer teams are informed that the case organization approves the return for 6 months and holds the right to do scrapping in the costs of customer team, if reuse does not realize in next 6 months and there is no demand for the items in the near future. In the new process the product line contacts support the buyers in the reuse. Product line contacts will give practical product support as per request. Counterparties will also seek for the reuse possibilities. In the new process flow chart it is also clearly indicated how the process will continue, if the items are not reused from the buffer. Return coordinator will monitor the time that the items have stayed in the buffer. Item with no reuse realized within 6 months analysis are done about future reuse possibilities. Item with no reuse possibilities and items turned to obsolete will be removed with performing scrapping after scrapping approvals are received.

4.7. Implementation and audit

In this chapter, the implementation of the development solutions is described. Also the audit is discussed briefly in the end of this chapter. The process flow chart presented in the previous chapter is from now on followed. The action plan created and presented in the previous chapter is followed. Ones a short term development task was completed the status of the task was changed to ‘done’. In previously presented solution description table 1 the status of task is marked to the next-to-last column. The first development steps were taken in long term development tasks. In the implementation the problem owner performed several concrete tasks as planned. The action plan was send to the team members during the implementation for them to see the tasks’ status of the time being.

First thing was that the problem owner asked for the instructions how to create the vendor return purchase orders from one of the buyers. The problem owner participated creating the vendor return purchase orders in guidance of the buyer few times and also receive written instructions for the process steps from the buyer. Since then the problem owner has been able to perform this task. The buyer key user opened a purchasing croup to the problem owner, so that problem owner is able to create the vendor return purchase orders’ in her own name in system.

The problem owner was in contact with those 3rd party vendors to whom items are regularly returned as per contractual terms. The means of communication about return requests were agreed with vendors. With the vendor to whom the return volume is the biggest it was agreed that a monthly meeting was set up. In the meetings problem owner and the vendor’s representative will go through the status of the cases occurred during that period. This meeting will ensure that no tasks are pending. Both parties have agreed that this is a good way of co-operating.

The problem owner created the OEM HW return instructions. The purpose of the instructions is to instruct customer teams in OEM returns. The instructions distinguish the cancelation and return cases. The instructions explain to the customer teams the risk of obsolescence of the return materials and cost effects of the return process. In the instructions it is explained how the return process starts and what are the preconditions, meaning items must be in original unopened boxes. Instructions also explain what approval or rejection decision of the return request means. It is clearly stated, that if the items are approved to be returned to buffer, but the items are not reused within six months and there are no future reuse possibilities then the customer team which originally ordered these products will carry the costs. Also it is stated that, if the value of the items exceeds certain limit, the names of the customer team's managers who can later on approve the scrapping in the scrapping tool are needed to be marked to the return form. Steps done in system when return is approved are also explained.

After writing the instructions the problem owner verified them with team members, global return concept owner and one customer team representative. The problem owner asked logistics coordinators of team order handling and logistics to distribute the instructions to their contacts, meaning all the customer teams handling OEM orders received the orders. The problem owner also asked the global return concept owner to create a direct link from case company's intranet pages dedicated to returns to these OEM return instructions. The link to the instructions is visible clearly in the main return intranet page.

The problem owner also held one training about returns to the specific customer team. A great opportunity was faced when one logistics coordinator from order handling and logistics team was send to train people in one specific customer team. This team had also some issues with return cases ongoing. The problem owner used the opportunity and that logistics coordinator was able invite all the relevant persons to a meeting. In the meeting the problem owner gave training to the customer team members presented the new instructions and also showed the return intranet pages.

The customer team asked some additional questions to some specific cases and returns were also discussed in general level.

Problem owner send first e-mail to the business unit, product line and product support contacts asking them to up date their contact information to the return and reuse process contact list. The list was updated according to the received feedback. Then the problem owner sent by e-mail to the updated contacts an information packages. The contact persons were informed about the importance of replying ones they are asked to estimate the likelihood of reuse in some specific case. For the case organization make the correct decision concerning return request, their estimation about reuse likelihood is essential, meaning the likelihood that there is a new customer order to which this item could be used within next 6 months. If they are not able to give this kind of estimation for some reason they were asked to also inform that. Also those who always answer quickly to these estimation enquiries were thanked. The importance of the up-to-date material status in system was emphasized. The contacts were asked to forward this message also to their own key users and product structure teams. They should note that when they change the material status to obsolete, it means that case organization is not able to reuse these items from the buffer any more, since items are blocked and can not be offered or ordered anymore. In practice it means that, obsolete items from buffer will be scrapped. Therefore they were asked to check, if there is a lot of items in stock before changing the status to obsolete. The contact persons were also informed that they will be receiving an up-dated buffer list with instructions how they can support the case organization in reusing items from buffer.

The problem owner modified the excel buffer list layout so that it is easier to read, removed old data, removed addition non value adding sheets, checked all the reference numbers of sales order and purchase order columns and added missing information and corrected incorrect information, changed the 3rd party vendor codes to the case company's items codes from system, added the material status and global invoicing codes based an a report run by business analyst; added a column for time

when the items have been moved to buffer, etc. A lot of manual changes and checking was done to the buffer list. It was also reviewed with the warehouse and the buyers that the layout is good for them. The inventory counting was performed in the warehouse in April 2001 and after that the buyers key user has performed the crosschecking of the physical buffer list and system buffer stock list with the help of the problem owner. After the inventory counting, including crosscheck, was finished, the problem owner distributed the buffer list to the counterparties together with briefing mail about the benefits of rue to the counterparties and instructions how they can in practice be involved in the reuse cases, and also the OEM HW instructions were there as attachment.

A long term development plan is to get the system to support the return and reuse process. The problem owner inserted following proposal to the case company's development tool where all the system development is inserted. Inserting a development proposal to the tool will start the evaluation of the idea, need and business case for system development and the process will move further. As stated in the limitations the full implementation of the long term development proposals is not in the scope of this thesis. First the problem and the need for the system development were explained. Then the idea of system development was presented.

The system should support the reuse of the items from buffer, so that no purchase request creation for the items which are in buffer, instead notification, meaning pop-up, for the buyer to check the suitability of the buffer item before vendor purchase order creation. It was also explained in detail what system modification would be required for the notifications to work properly. A separate stock in system for buffer items with limited access rights would be needed to ensure the items are physically also available for reuse. The stock should have limited access rights to case organization users to ensure that only returns approved by case organization can be moved there. Virtual returns should be done trough separate stock so that there is no confusion with the virtual returns i.e. order correction returns and 'real' returns. Virtual returns are used for returning the items temporarily and delivering the items in

new sales order. The mistake that has occurred in the original sales order has been fixed in the new sales order. Explanation of the technical issues related to the system is not cover in too much detail in this thesis. Also the business case, mainly form the perspective of reuse potential in buffer was explained in the development proposal.

A long term development plan is to get a process for selling in reduced prize. The key driver in this issue is the controller of the case organization. The controller is also one of the team members of the development project presented in this thesis. The point is that there are some obsolete OEM materials which some brokers are willing to buy with reduced price. The work with this issue is ongoing. Meetings about this issue were hold, one system solution was chosen from the alternatives, and the chosen proposal is inserted to the case company's development tool. In the meetings the controller presented two alternative system solutions: one was more manual, one was old fashion and one, the selected one, was to sell through component sales process. This system process exists already in other parts of the case company's system, but currently is available in the case organizations system module. This means that the effort in system development should not be big. The controller has calculated the business case of this development to be beneficial so the proposal was inserted to the case company's development tool.

In the audit and evaluation meeting the action plan and the status of tasks were also reviewed with the team members. The problem owner reviewed to the team members what was agreed in begin of the process that what needs to be developed. What were then later on the agreed actions, and what is the status of those actions. The check in the solution description table 1 in the last column means that the status was audited and evidence are available that the actions have been taken. In the audit and evaluation meeting also evaluation was done and future development was discussed.

5. CONCLUSIONS

This chapter will conclude this thesis. First, the evaluation and conclusions are presented. Then, recommendations for the future studies are discussed.

5.1 Evaluation and conclusions

In this chapter, the outcome is evaluated and conclusions are drawn. Evaluation methods presented in the research context are applied. First, it is evaluated whether the research questions have been answered. Then, several other elements are evaluated: return and reuse process, development process and business results; research done in this thesis, the case study and the whole thesis. Positive and negative aspects are considered. Most importantly lessons learned are written.

Answers to research questions

The research question, what is the optimal reverse logistics process, can be answered from both theoretical and empirical perspective. As a conclusion of the theoretical framework the optimal reverse process can be defined as following. The optimal reverse logistics process is efficient, cost effective and timely flow of goods, money and information moving goods from their typical destination to some other point at the same time recapturing value and generating opportunities to achieve competitive advantages to the company.

In case organization the optimal reverse logistics process in practice is that customer team send the return request to the return coordinator immediately when the need for return has occurred. Then within the contractual time limits the items are returned to the 3rd party vendor and a credit from the vendor is received. If the return cannot be returned to the original vendor, then the reuse possibilities are quickly estimated by product line or business unit contact and when the items have over 50% likelihood to be reused, they are moved to buffer. The counterparties are informed about the items

available in the buffer. When a next suitable new customer order is placed, the technical and logistics management team and buyers' team are informed already beforehand by the counterparties, that to this specific order items will be used from buffer. Items are reused to a new customer order within next six months and scrapping is avoided. As a conclusion the optimal reverse process when the items can not be returned to the original vendor is that items are reused to a new customer order within 6 months from return.

The different options when the items cannot be returned to the original vendor were discussed in this thesis. The options are: return is approved since the likelihood of reuse is estimated to be higher than 50% and items are moved to buffer from where they are reused; return is approved since the likelihood of reuse is estimated to be higher than 50% and items are moved to buffer and scrapping is performed due to the fact that no reuse possibilities realized; items are not approved to be returned since the likelihood to reuse is lower than 50% and scrapping is performed. The choice between these three options is done based on the evaluation of the likelihood. The criteria, likelihood percentage 50%, are defined by the case company finance and controlling. The fact that is needed to make a decision between these options is the estimation on the likelihood of reuse. As learned, if the business unit or product unit contact is not able to give this evaluation also material status of the item can be used for evaluating the likelihood of reuse. Also a long term development plant to get a process for selling to the broker from buffer is an addition to the options. The process for selling to a broker has several positive impacts: it would create opportunities to get value out from the obsolete materials; the inventory values would decrease and the inventory turnover would speed up. As a conclusion an addition to the three existing options is needed.

Also the cost effects and who will carry the costs were covered. These issues relate to the important decision made concerning scrapping. It was decided by finance and controlling that the case organization has the right to do scrapping at the cost of customer teams from buffer. This affects the criteria of the gate keeping, the layout of the process and has cost effects. This enables the case organization to focus on reuse. From the case company's perspective this alternative is the most cost effective, since it allows the case organization to concentrate on getting value out from the returned items. If the case organization would have the fear that they would not be able to do the scrapping at the cost of customer team later on the criteria's to, approve items to buffer would surely be much tighter and more time would be consumed in the decision making process. As stated several times earlier, the decision making is based on estimations. The customer teams are now informed about the risk of obsolescence of the return materials and cost effects of the return process clearly in the return instructions. As a conclusion the customer team will carry the cost of the returned items, if the case organization does not successfully reuse the items to a new customer order. This is the risk that customer teams consciously take. Benefits to the case company are cost reductions due to effective reuse and on the other hand due to proper scrapping performance.

Due to the high value of the items the successful reuse of the items covers the costs related to returns. Nevertheless, as stated in the theory the cost monitoring is essential. The process must be managed so that reverse logistics process costs, compensation to the customer and inventory costs are less than benefits arrived. Failure to track the real costs, including all the hidden costs, can cause difficulties to proper decision making. As a conclusion the case organization needs to monitor the costs related to returns more efficiently.

The process steps descried in figure 17 are currently necessary for the process to work in practice. Although, there are several steps and the process is complicated, each step has some purpose to some participant in the process. The process steps can not be considered only from the perspective of the case organization, but also from the perspective of counterparties. By cutting down some process steps the flow of the items and information would not go smoothly. The process step that was discovered to be not value adding, were the steps: when return coordinator asked the category specialist to contact the 3rd party vendor and ask for the return approval; and when return coordinator asked the buyer to create the vendor return purchase order in a system as the last stage of the process, when items are returned to vendor. It was agreed that the return coordinator can contact those vendors directly to whom return permission is stated in the contract. It was also agreed that the return coordinator can directly perform the vendor return purchase orders actions in system and no need to ask the buyer to do it. As a conclusion the process includes the necessary process steps in order for it to work in practice and each step has some purpose to some participant in the process.

The process was made more transparent by changing the layout of the buffer list and also adding there some information, like date when the items were moved to buffer, to the items missing the reference numbers they were added, etc. This increased the visibility in the long term and now it is more possible to follow the return cases for also the items that have been moved to buffer. Previously this was the point when the visibility was lost. Also communication practices related to updating buffer list with the current warehouse provider were changed, but this thesis will not go deeper in to that issue as stated in the limitations. Also a long term system development proposal was formed. The buffer excel list and the system should match all the time and thus there needs to be a separate stock in the system for the items that are physically also in buffer stock. This system development was part of the log term development solutions, which included also the notifications to the buyer about possibility to use items from buffer. Unnecessary process steps, when the return coordinator, problem owner, asked the category specialist to contact the vendor or asked the buyer to create

the vendor return purchase order, were removed. This increased the pace of the actions and created better visibility to the problem owner to see that the process in system is finished. As a conclusion there were several actions taken to improve the visibility and the long term development solution would improve the visibility considerable. The system needs to support the process properly, thus the system needs to be developed for enabling the visibility to increase.

Instructions are now indicating clearly who participates in the process and what the role of the participant is. The instructions are available to everyone in the case company's intranet. The link to the instructions is well visible in the main return intranet page which helps people to find the correct information. The customer teams are now more and more aware how the return and reuse process goes. The instructions have helped the problem owner in her daily work a lot, since instead of written the same instructions to everyone requesting to return something, the problem owner is able to send the link to the instructions ands if needed, writing only some additional lines to special cases by case. As a conclusion the clear instructions have been possible the most effective tool in changing the return and reuse process more effective. The instructions tackle the obstacles in the daily work of researcher. This was the target of this thesis, to tackle daily obstacles.

The supporting question, how is the process measured, was formed based on the theoretical findings. The team did not define the measuring of the process to be problematic or that this area would require development. The other issues were prioritized. The only thing that was discussed related to measuring was the time the items stay in the buffer. Currently the process is measured monthly with inventory levels and inventory turnover. The inventory levels are analyzed and discussed in the inventory management meeting. Also issues connected to returns are discussed. Most of the team members participate in this inventory management meeting, including the problem owner. The theoretical point of view has raised the need to discuss the process measures further and there is still a lot of development to be done in this area in the future.

Statistical evaluation

Statistical analysis is used to evaluate the impacts of the return and reuse process development to the inventory level and inventory turnover. In below graphic the inventory level of the buffer and inventory turn over of the total stock are shown from May 2009 to April 2010. The inventory level of the buffer is the monetary value of the items in buffer. The left hand side x-axis illustrates the inventory value of the buffer. The value increases when the value of the returns is approved to be moved to buffer. Value of the reuse and value of the scrapings will decrease the inventory level. The inventory level has stayed somewhat stabile in the time period. The right hand side x-axis illustrates the days the items stay in the inventory. The inventory turn over is not calculated only to the buffer stock. The inventory turnover includes the values of normal stock and inventory stock. The speed with which the items move through the buffer will contribute to the inventory turnover. Normal stock is the major factor relating to the fluctuation of the inventory turnover. The target is to decrease the buffer inventory level and speed up the inventory turn over. It is too early to draw conclusions from the inventory levels and inventory turn over at this stage. The effectiveness of the process will be seen in these values in the long run.

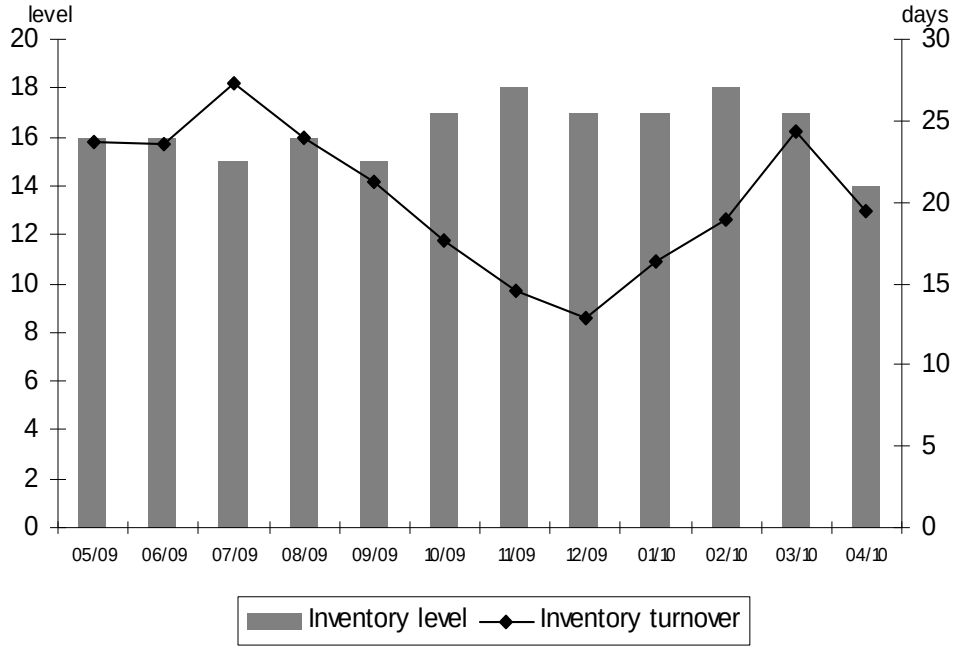

FIGURE 18. Buffer inventory levels and inventory turnover

Evaluation by the team and researcher

The team was asked to evaluate the return and reuse process development. In the following the answers of the team are summarized. According to the team a clear, streamlined and centralized return and reuse process description was created and new process was taken into use. Problems were fixed on practical level and accomplished changes have made return and reuse process all the time smoother and better. People are more and more aware how returns should be handled and via whom. There are positive impacts on inventory levels. Also the product support has improved, but seeking for the reuse possibilities needs more emphasis in product line, business unit, product support and customer teams. Co-operation with product line and business lines can always be better but the team realizes that it is really difficult to improve the co-operation in a company like case company due to continuous organization changes, separate product lines to different products and so on. Nevertheless, this is something that has to be developed even more in the future. Product line and business unit could have been involved in the process more. Now when the contact list is up-to-date it has to be kept up-to-date. Important issue is that buffer reuse should still be made easier somehow.

It was also noted by the team that unfortunately the long term development solutions will take a long time to realize. The team members realized how complex return and reuse process can be and why counterparties are needed. The team also understood the fact that this kind of process cannot be changed quickly and step by step, small actions improvement can be reached. The team stated that this was the starting point and development work, including simplifying, will continue. The team thinks they are on right track here. The presumptions were based on learnt facts and team can continue development based on those facts. The supplier contracts were pointed out to be important future development area and they are discussed in the following chapter.

The team had good cooperation, worked dynamically and there were goods discussions. The team members also stated that the problems owner's meeting practice was good: meetings were short, about one hour; they wee not hold too often, the problem owner was well prepared to the meetings; and the team members were asked to comment case by case. All in all the team was happy with the good work done.

Now when the team's feedback is summarized, also the researched own opinion is stated. Researcher own opinion is that the goal of the development work was accomplished. The return and reuse process is now more effective. The problems were fixed in practical level and this is in line with the purpose to help the daily work with this development. That being said, it is also important to emphasize that the value of the OEM items is high and with these practical actions the processes have become more effective, meaning money vise the impact is relatively high. With hindsight, the researcher could state that maybe one additional team member could have been invited from the product line or business unit. Then even more perspectives to the issues could have been received. On the other hand, it was important first to get every ones opinions in the case organization to be in line and in the future there is a need to concentrate even more to the relationships with counterparties. Although the researcher has worked with returns a lot, she still learned new thing during this process. The best things were the discussions with the team members and the deeper understanding of the issue and learning to understand the different alternative ways of looking at the issues. This project also empowered the researcher to do process development in a larger scale and the researcher will continue to develop the process. The researcher has always been an active participant in the case organization, but this development work has encouraged her to be even more proactive. With the support and help of the team members the development work and this thesis were possible and the researcher is thankful for that.

Evaluation of the research

When evaluating the research done in this thesis the validity, reliability and generalization are to be considered. The research findings reflect the return and reuse process which was studied relatively accurately. The fact, that team members participated in the development process and researcher was in constant dialogue with them and other members of the case organization, has increased the validity of this research. The phenomena was not only looked from the perspective of the researcher, but also others opinions affected the research. This thesis reflects the different dimensions of return and reuse process relatively accurately.

Reliability of this thesis is difficult to estimate. The changes effected by the time and team members increased knowledge would change the course of the events if the researcher would repeat the research. The biggest problem if an independent observer was to replicate research would occur with the observations. The independent observer would lack the know-how of the researcher and (s)he would not be able to get the same results with observations done as the researcher. The independent observer would not have the competence of the researcher about the issues. The researcher's position and knowledge has affected the course of the events.

This thesis can not be generalized in a wide scale. The research done relates highly to the case company and case organization. The generalization inside the company is not possible, since the nature of the so called core products of the case company is different from OEM products. The generalization of the research to other similar OEM return processes, for example what the competitors of the case company has, would not be possibility in large scale, since the process is connected to the internal company's policies. The usefulness of the theoretical frame work of this thesis has wide prospective to be relevant to everyone interested in reverse logistics, specially related to returns with similar product nature. The research done in this thesis has been consistent with the original idea to develop the return and reuse process of the

case organization. The phenomenon has been well reflected and studied from different perspectives.

The case study was significant to the researcher, team members and case organization. To researcher learned new things, theoretical and practical, and got also wide theoretical aspect to her work. The process changes have made researchers and also team members' daily work to be more effective and smoother. The team members, including researcher, got a wider and clearer picture from the over all return and reuse processes. The return and reuse process is significant to the case organization, since it has direct impact on the inventory levels and also other financial impacts. The return and reuse process are interesting to the researcher and team members since they all are interested in developing the process to make their daily work smoother and to contribute to the case organizations results. The case organizations management is of course interested in the results of this development.

The case study was completed during a satisfactory time period, from October 2009 to May 2010, and according to the originally planned timetable. Two months extra time was taken to complete the implementation, because the physical inventory was also done before publishing the buffer list to the counterparties. This increased the accuracy of the data, but delayed the implementation. Nevertheless, the whole timeframe of this thesis was hold. According to the original timetable the thesis was to be ready in May 2010 and that time limit was exceeded only by some days. The case company had not set any strict time limit to finish the case study or the thesis work.

To sum up the conclusions drawn in this chapter, the return and reuse process is now more effective. The return and reuse process is in line with the case company's strategy. Fast decision making, prioritizing, co-operation within the company and importance of the inventory management are all aspects of the more effective return and reuse process. The case organization has now turned the focus on the seeking for reuse possibilities; involved the counterparties to the return and reuse process; and

raise the awareness of customer teams about risks related to returns. Specific ideas about the system to support the process including increate the visibility and the system to enable selling to a broker have been generated. The impacts on the inventory level and inventory turnover will be seen in the long term. The problems were fixed in practical level making the daily process run smoother. A deeper understanding of the whole return and reuse process and related issues was discovered by investigating the issues from several perspectives. Knowledge of the participants was essential and new things were learned during the development work.

5.2 Recommendations for the future studies

In this chapter, the recommendations for the future studies are discussed. There are three recommendations: simplified approval process; better vendor contract terms concerning returns; and even deeper co-operation with counterparties. Radical changes to the return and reuse process would require changes in vendor contracts and changes in the approval policy and also deeper cooperation and coordination between the case company’s internal organizations. The importance of the cooperation and coordination between different case company’s organizations can not be over emphasized. This issue has been widely discussed in this thesis.

The improvement needed in the approval process is simplification. Currently the customer team needs to seek for approval to order items under risk order process. If the risk occurs and the deal with the end customer is lost the customer team will start a return process. If the value of the items in the return request exceeds a certain limit, the approval of the customer team management is needed, since their name is marked to the form as approval of possible scrapping. The management needs to understand the risk of obsolescence of the return materials and cost effects of the return process. Then if the items are approved to be returned and moved to buffer, but reuse has not realized in next six months and no reuse possibilities in the future are seen, the case is inserted to scrapping approval tool and in the tool the management has to approve the

scrapping of the items. After this approval the actual scrapping, in system and in practice can take place. The customer teams management approves three times the same risk: first when the items are purchased under risk order policy; second time when the customer team would like to return the items; and third time when the items are scrapped due to the fact that no reuse possibilities occurred, in other worlds items have turned obsolete. The customer teams takes the risk when they place the order and they should be well aware of all the possible consequences and cost effects of time risk, so would only one approval from the customer team management be enough to carry the whole process. Combining these approvals would simplify and make the process more effective.

In the limitations of this thesis it was stated that the target of this thesis is not to try to improve the vendor contracts, but to find effective ways to handle the items when the return to vendor is not possible by contractual terms. It was seen unrealistic to develop the vendor contracts under the prevailing overall economical circumstance. Now there can be seen positive signs in this are. Vendor contracts terms related to returns are a major development possibility in the future. There is already one encouraging example of negotiating more favorable terms for returns to the contracts. With a particular vendor the case company was able to negotiate a deal where there is a possibility to return the items ordered under risk order title for agreed time period and agreed value limit per quarter. Discussions with suppliers about terms of return needs to continue in the future. Case company needs to try to negotiate better terms for return to vendor contracts.

6 SUMMARY

In this chapter the thesis is summarised. The topics presented in this thesis are covered shortly and main points are highlighted.

In this thesis the reverse logistics theory was studied and applied in to practice in the case study. Reverse logistics is a process of moving goods, money and information from their typical destination to some other point in effective, cost-effective and timely manner and at the same time recapturing value. The case study has been conducted in the case organization, which is responsible for order handling and purchasing of OEM (original equipment manufacturer) items and related logistic activities, thus also reverse logistics. OEM hardware items are physical equipments used in telecommunication systems purchased from third party vendors. Complicated configuration of the items and requirement that reused items need to be in original condition, meaning in unopened boxes, create challenges to the return and reuse process. The goal of this thesis was to develop the case organizations return and reuse process to be effective and cost efficient. The focus was to tackle the obstacles faced in the daily work and at the same time drive for efficiency.

The theoretical frameworks task was to support the case study, thus only the theory related to the case study was covered in this thesis. Reverse logistics process consists of several steps, such as gate keeping, collecting, sorting, disposition. The time-sensitivity of returns and opportunities offered by the secondary markets are important to note in the process. Returns are impacting inventory levels and have also other financial impacts. Inventory management has received attention from the point of view of eliminating as much inventory as possible. The case organization has also noted the importance of inventory management and recognized the importance of effective return and reuse process. It should be also considered that inventories also represent potential and untapped value. Effective return process is able to get residual value out from the returned products. Accurate and timely information in transparent system will enable tracking of status, location and costs, and also enable to spot the

cost-effective disposition solution. Information about process performance and the costs related to the process are vital for proper decision-making processes. Clear guidelines and co-operation of involved parties are key elements of effective reverse logistics process.

The case study was conducted during time period from October 2009 to May 2010. The researcher acted as the problem owner in the development project. The participation of the team members in the development project was essential, because their commitment is needed for the process to work in real life and the knowledge of the team members was needed for the process development. Qualitative data was retrieved from team and individual interviews and participant observation. The problems in the original return and reuse process were defined to be: facts missing for decision making; lack of customer teams co-operation and awareness about costs; lack of practical product support; lack of active participation of counterparties for seeking reuse possibilities; lack of transparency and no process for selling items in reduced price. Root cause analysis of these problems was performed. The problems in the original return and reuse process were tackled in practical level. Based on analysis development proposals were defined for short and long term.

Following short term development proposals were implemented: counterparties contact list and information package to the counterparties; create and publish return and reuse instructions for customer teams; modify, up-date and distribute buffer list to counterparties; and combine internal process steps. Long term development proposals about how the technical system could increase the visibility in the process and how the technical system could enable selling items to a broker have been generated. Long term development proposals are in progress and will take time to realize.

The research question, what is the optimal reverse logistics process, was studied from both theoretical and empirical aspect in this thesis. The optimal reverse logistics process from theoretical perspective is efficient, cost effective and timely flow of goods, money and information moving goods from their typical destination to some other point and at the same time recapturing value and generating opportunities for the company. In the case organization the optimal reverse logistics process when the items cannot be returned to the original vendor is that the items are reused for a new customer order from buffer within six months from return.

The accomplished changes have made the return and reuse process streamlined and effective in the case organization. The problem owner and the team members learned a lot during the development project. A wider picture and deeper understanding about the return and reuse process was accomplished. As a result of the conducted development the case organization has now turned the focus on the seeking for reuse possibilities, involved counterparties to the process and raised customer teams awareness about return and reuse process and costs and risk related to the process. Development has changed the return and reuse process to be effective due to fast decision making, prioritizing, co-operation within the case company, raised awareness about the process and tight inventory management. Combining even more process steps, developing deeper co-operation and negotiations with vendors will enable the return and reuse process to be even more effective in the future.

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Team members:

Business Analyst
Buyer
Controller
Key user of the buyers

Other participants:

Head of Purchasing
Order Engineering Logistics Manager
Order Engineering Specialist
Team Leader, Logistics and Technical Management team
Team Leader, Purchasing team