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SCHOOL OF BUSINESS, ECONOMICS AND LAW

Master Degree Project in Logistics and Transport Management

External Prerequisites for Reverse Logistics

An exploratory study of electrical and electronic products on the Swedish and Indian market

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Abstract

Electronic waste constitutes a growing problem. Large volumes of electronic waste are generated each year and continue to rise. Electrical and electronic products are if mishandled hazardous to both environment and people. Reverse logistics is the tool used to handle these products. This qualitative study explores how reverse logistics development is affected by external factors and how drivers stimulate development within the context of electrical and electronic products.

This research is a comparative study of the Swedish and Indian market. The research shows that differences exist between the two countries in both approach and execution. Historical development, values, norms and conventions contribute to the differences found. A regulatory framework is by the respondents identified as a clear prerequisite for reverse logistics. Regulation creates a safe environment through control over the processes used to address reverse logistics issues. Respondents also highlight the importance of economic and legislative drivers. The economic driver is given more weight in India compared to Sweden due to lack of legislation and consumer pressure. In Sweden, consumer pressure influences companies to reduce their environmental impact. This means that corporate citizenship and environmental issues play a larger role in Sweden compared to India.

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1. Introduction

This chapter will provide a background into the context that has led us to formulate the purpose and research questions; state necessary delimitations and provide an outline for the structure of the thesis.

1.1 Background

Complex and developed logistics systems have long played a vital role for efficient and effective[1] material flow between suppliers, manufacturers, distributors, wholesalers, retailers and final users. However, historically, once product delivery is complete less attention is given. This is now changing. Enter reverse logistics.

Reverse logistics is the flow of information and goods moving up the supply chain. It is defined by Harrison and Van Hoek (2011:141) as:

> *The flow of goods that go back up the supply chain for a number of reasons, including: product returns, repairs, maintenance and end-of-life returns for recycling or dismantling.*

As such, reverse logistics is the logistics activities that take place once products are no longer used or wanted by the user, until products again are available in the marketplace (Fleischmann et al., 1997:2). Figure 1.1 shows the continuation of the forward flow into reverse logistics.

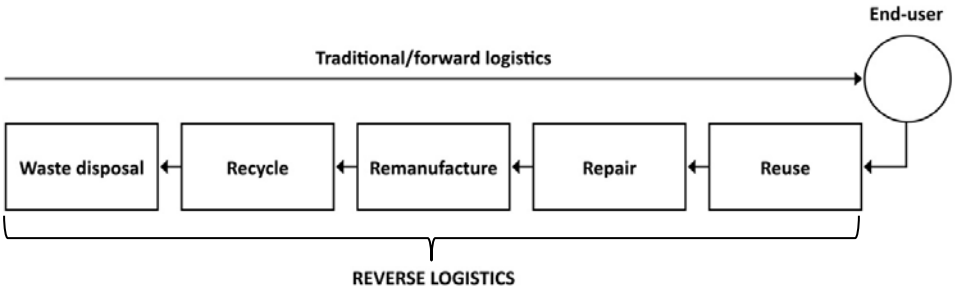

Figure 1.1 *– Reverse logistics, adapted from Hanafi, Kara and Kaebernick (2008:368)*

However, even though the importance of efficient and effective reverse logistics systems is now recognized, implementation of reverse logistics functions is not without problems. Harrison and Van Hoek (2001:141) state some of the reasons for this. Companies often lack suitable infrastructure for reverse logistics activities. Instead, the same infrastructure is used for the reverse flow as for the forward flow. The approach taken by companies is often reactive instead of proactive. Reverse logistics is merely viewed as a cost of doing business and does not receive enough attention from management. Additionally, the difficulty of forecasting return volumes may reduce the appeal of reverse logistics.

[1] Efficiency is defined here as *how well the resources expended are utilized* (Fugate, Mentzer & Stank, 2010:45). Essentially this means the ability to offer an acceptable product or service to an acceptable price. Effectiveness is defined as *the extent to which […] goals are accomplished* (Mentzer & Konrad, 1991:34). As such, it measures the capacity to achieve objectives, e.g. certain material recovery thresholds or recycling goals.

However, the gains that companies' and society stand to realize from efficient and effective reverse logistics systems are many. Therefore, reverse logistics is now beginning to receive increased attention. There are four primary drivers behind the growth of reverse logistics. These are economic factors, legislative factors, corporate citizenship and environmental issues (Ravi, Shankar & Tiwari, 2005:331). These drivers manifest as determination of companies to achieve cost savings from reuse of materials, repair and through remanufacture of failed products; regulatory initiatives that push take-back obligations and extended life cycle responsibility for producers; better customer service by handling returns in a more expedient manner; innovative after-life management of products that serves to augment a company's public profile; and a growing environmental awareness of material extraction, material selection and waste handling.

As of the reasons stated here, it is clear that reverse logistics is important to develop and explore further. Reverse logistics ought to be a part of each company's logistics activities and should not be viewed as worth less than traditional forward logistics. However, as will be shown, the development of reverse logistics is not only dependent on the activities and prerequisites of the individual company, but is instead subject to external forces.

1.2 Problem Formulation

An initial literature review made it clear that reverse logistics, as a broad topic, is well-covered by previous research. Rogers and Tibben-Lembke (2001) define reverse logistics and examine how it is viewed by logistics managers. Fleischmann et al. (1997) provide a review on its operational dimensions and contrast this to traditional forward logistics. Cairncross (1992) describes the development of European environmental legislation and the effect this has on companies.

A major focal point of reverse logistics is the handling of electronic waste (e-waste). E-waste is a term used to describe discarded electrical and electronic products (e-products). Large volumes of e-waste are generated each year and continue to rise. Estimations put the total amount of e-waste generated annually to 20-50 million tons (Ongondo, Williams & Cherrett, 2011:725). These products are if mishandled hazardous to both environment and people. Therefore, legislative initiatives and infrastructure development in developed nations focus on the safe and expedient handling of e-waste.

The situation in developing nations, however, is not the same. E-waste management in e.g. China and India is still in its initial stages. In such countries, focus is placed on achieving low production cost. However, according to Srivastava and Srivastava (2006:525) the situation in non-OECD countries will change. Globalization and growing consumer awareness will force companies to devote more attention to e-waste management in the future. Due to the growing concern of e-waste management, reverse logistics, as it applies to electronic products, is well researched. Highlighted here are studies complementary to our research. Lifset, Atasu and Tojo (2013) examine implications of extended producer responsibility and product design. Goosey (2004) gives a review over end-of-life electronics legislation. Ongondo and Williams (2011) review the current practices for e-waste in developing nations. Findings indicate that this is a topic that will see increased attention in the future.

Reverse logistics for e-products is not limited to a discussion around e-waste management, even though this dominates the current discussion. In line with the definitions stated earlier, it also

encompasses value added recovery processes in the form of repair and remanufacture and other reuse activities. As such, these topics must also be addressed.

Advancements in reverse logistics are governed by several external factors. External factors are non-company specific factors related to the surrounding environment. According to Carter and Ellram (1998:94) it is only when the strategy of a company matches that of the surrounding environment that a venture may thrive. External factors can be separated into four categories: First, actions taken by and with competitors; second, current and future regulatory framework; third and fourth, upstream and downstream supply chain relations. In addition to this, the overall macro environment also affects reverse logistics development.

As such, this thesis is a study on how external factors act as prerequisites for the development of reverse logistics and how the aforementioned drivers stimulate this development. An exploratory comparative study between the conditions in Sweden and the conditions in India will allow for identification and analysis of this.

1.3 Purpose and Research Question

The researchers wish to study how external prerequisites affect the development of reverse logistics for e-products. In order to do this, the researchers explore the motives behind reverse logistics functions as it relates to e-products in Sweden and contrast this to the situation in India. Consequently, the research question that this thesis will answer is formulated as:

How do external prerequisites affect the development of reverse logistics for e-products?

To complement the research question, one sub-question is formulated:

How do drivers stimulate the development of reverse logistics for e-products?

As stated earlier, external prerequisites are separated into four primary factors. For a more precise definition of areas relevant to our research and in order to make the research process easier, the research questions are broken down into concrete variables. The main research question is broken down into:

Competitive factors – In where we explore how actions of competitors affect the development of reverse logistics.

Regulatory factors – In where we explore how legislative initiatives affect the development of reverse logistics and provide a review over the current regulatory framework.

Upstream supply chain – In where we explore how collaboration or non-collaboration with actors upstream in the supply chain affects the development of reverse logistics.

Downstream supply chain – In where we explore how collaboration or non-collaboration with actors downstream in the supply chain affects the development of reverse logistics. This includes the consumer pressure imposed by final users.

Macro environment – In where we explore how the overall macro environment affects the development of reverse logistics.

The sub-question is broken down in a similar fashion. Literature identifies four primary drivers for reverse logistics. Therefore, the drivers relevant to our research are:

Economic drivers – In where we explore how companies' strive for cost savings and value recovery stimulate the development of reverse logistics.

Legislative drivers – In where we explore how take-back obligations, producer responsibility and other regulatory directives stimulate the development of reverse logistics.

Corporate citizenship – In where we explore how companies' strive for enhanced corporate image stimulates the development of reverse logistics.

Environmental issues – In where we explore how environmental issues and greening of the supply chain stimulate the development of reverse logistics.

1.4 Delimitations

Due to time restrictions and the limited scope of this thesis, delimitations were necessary. First and foremost, this thesis investigates reverse logistics as it applies to electrical and electronic products. This means that the research ignores other product categories that also can benefit from efficient reverse logistics systems. This ensures a more focused research.

Furthermore, a company's ability to create an efficient and effective reverse logistics system can be said to derive from both company specific- and non-company specific factors (Carter & Ellram, 1998:90). However, this thesis is only concerned with how non-company specific factors act as prerequisites for the development of reverse logistics systems.

Moreover, efforts have been made to ensure that the data collection and subsequent empirical material will offer a holistic view. However, this material is restricted to the views of producers, service providers and trade associations. This means that the views of the individual final user are outside the scope of this research.

1.5 Thesis Disposition

Figure 1.2 shows the disposition of the thesis.

Figure 1.2 *– Thesis disposition*

The thesis starts with an *Introduction*. This provides the reader with a necessary background into the topic. Subsequently, problem formulation, purpose and research questions are presented.

Chapter two contains the *Theoretical Framework*. This chapter gives an overview of the theory relevant to our research. The main areas are definitions, reverse logistics dimensions, issues associated with e-waste, external factors, drivers and a section on the main characteristics of e-waste management in Sweden and India.

Chapter three explains the *Methodology* employed in this thesis. The chapter describes our research philosophy and the research design which have guided the research. Furthermore, the data collection process is explained. This is supplemented with a discussion around research quality.

In chapter four, the *Empirical Findings* are presented. This is the data that has been retrieved through interviews. A description of the respondents' company/organization is given. The main topics covered in this chapter are the external factors and drivers as viewed by the respondents.

Chapter five contains the *Analysis*. In this chapter, empirical findings are analyzed. The material retrieved through interviews, together with theories presented in the theoretical framework, provides the basis for this analysis. This chapter then serves as the foundation from which conclusions are drawn.

Chapter six provides the *Conclusion*. The research questions are answered and a summary of the study is presented. The chapter is then supplemented with suggestions for future research.

The thesis is finally concluded with chapters 7 and 8. These contain *References* and *Appendices*. Included in the appendix is an exhaustive list of WEEE-categories and the interview structures used for interviews.

2. Theoretical Framework

This chapter will provide a description of relevant existing theory within the context of reverse logistics. The chapter forms the theoretical foundation of the thesis. A comprehensive depiction is given on the topic of reverse logistics as it is traditionally understood in current research. Furthermore, external factors and drivers are defined. The chapter is concluded with a description on the current situation in Sweden and India.

2.1 Definitions

The definition of reverse logistics has undergone several changes since it was first introduced as a concept in the early 1980's. In the 1980's reverse logistics activities was limited to account for the reversed direction of the material flow (Rogers & Tibben-Lembke, 2001:129). In 1998 it was defined by Stock (1998 cited in Rogers & Tibben-Lembke, 2001:129) as:

> *The role of logistics in product returns, source reduction, recycling, materials substitution, reuse of materials, waste disposal and refurbishing, repair and remanufacturing.*

A second definition is provided by Rogers and Tibben-Lembke (2001:130):

> *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 purpose of recapturing or creating value or proper disposal.*

By examining the different definitions it is possible to see the transformation reverse logistics has undergone during recent years. From purely concerning the reversed direction of material flow, to focus more on reduced supply chain environmental impact, to a wider definition including economic aspects. In developed markets, it has now evolved into an often necessary, standalone, process in need of managerial attention (Hazen, Hall & Hanna, 2012:245).

2.2 Reverse Logistics Dimensions

The concept of reverse logistics may come in many forms and may range in scope and presentation. This is the result of how internal and external factors affect each company and situation. Therefore, in order to familiarize the reader with theories and concepts used in subsequent chapters, a broad depiction on the dimensions of reverse logistics is given.

2.2.1 Product Categories

Manufactured products have many different characteristics. As such, a separation of products into different categories can help the reader understand how they affect reverse logistics activities. On an aggregate level, products can be segmented into three categories. These are: Packages (e.g. bottles and pallets), consumer goods (e.g. copy machines and refrigerators) and rotable spare parts (e.g. machine parts). These products are segmented due to their returns disparity. Packages will be returned as early as their purpose is fulfilled. This is often soon after delivery. Consumer goods are returned at the end of their life cycle. In addition to the longer time span, this also often means that the product is outdated. Finally, rotable spare parts are returned should failure occur. (Fleischmann et al., 1997:3)

Within a narrower context, electrical and electronic waste is found. Under the definition above, e-waste can be both consumer goods and rotable spare parts. E-waste is a collective term, used to describe discarded electrical and electronic products. It includes products that are reused, repaired, recycled and remanufactured. These products are if mishandled hazardous to both environment and people. Electronic products contain contaminants such as brominated flame retardants, cadmium and lead (Wath, Dutt & Chakrabarti, 2010:251). Moreover, as e-products contain valuable materials, these are attractive to harvest. This process is often hazardous, where e.g. acid baths are used which contaminate ground and water sources (Ongondo, Williams & Cherrett, 2011:725).

A precise figure is hard to produce, however, according to Ongondo, Williams and Cherrett (2011:715) estimations put the total amount of e-waste generated annually to 20-50 million tons. Per capita, the majority of e-waste is generated in OECD countries. This is due to the saturated market for electronic equipment where new products are in demand. Data for EU countries show that 6.5 million tons are generated each year. This figure is expected to increase with 16-28 percent each year. Moreover, a growing market penetration for electronic products will increase the e-waste generation in developing countries as well (Manomaivibool, 2011:137).

2.2.2 Different Forms of Reuse

Product reuse is not new. However, a growing concern for environmental issues has increased the attention it receives (Fleischmann et al., 1997:1). Product and material reuse can take many different forms. Definitions provided by Thierry et al. (1995:120) are widely used. These are: Direct reuse, repair, refurbishing, remanufacturing, cannibalization and recycling. Fleishmann et al. (1997:3) identify direct use, repair, recycling and remanufacturing as the main forms of reuse. Packages and containers may be reused directly with minor maintenance. Repair of products means bringing failed products back to working order, e.g. defective electronic equipment. Recycling refers to material recovery without preserving the structure of the product, e.g. metal recycling from scrap. Finally, remanufacturing is concerned with reviving failed products to the same condition as newly manufactured products. As such, a difference between material recovery (recycling) and added value recovery (repair and remanufacturing) is seen.

The forms for reuse will differ. According to Fleischmann et al. (1997:3) this is because the aforementioned product categories differ in production planning activities, as well as in required expertise and skill. This sets constraints on the actors involved in reuse activities. Necessary functions include collection of products, product testing and the actual reprocessing. Moreover, there is a distinction between reuse of the producer of the product and reuse of a third party. An integration of forward and reverse logistics activities is made more difficult due to this.

Fleischmann et al. (1997:4) state that product recycling is often performed by specialized companies. Specific product knowledge is not as critical for this activity. Repair and remanufacturing is normally performed in-house by original producers. Furthermore, third party logistics providers have extended their services. Companies now specialize on collection of used products and back-haul transportation.

2.2.3 Directives and Policy Initiatives

Today, several countries have enforced environmental legislation for production and after-life management of products. This means that producers are charged with product life cycle responsibility. This can manifest as take-back obligations for used products or restrictions on the use

of certain materials in the production process (Directive, 2011). In Germany 1991, regulation forced industries to recover packaging materials. Similar regulations were in place for e-waste in 1996 (Fleischman et al., 1997:2). Scrapped cars have to be dismantled in an expedient manner (Cairncross, 1992:37). In the early 1980's, the European commission forced Denmark into using refillable bottles. The commission insisted that environmental concerns should be taken into consideration, rather than claims of free trade. Denmark objected. The commission subsequently took Denmark to court and succeeded with the implementation of its environmental requirements (Cairncross, 1992:40). Environmental pressure is imposed from both governments and customers. This fact shows the importance for companies to meet these requirements.

In many ways, EU is driving the development of environmental initiatives. EU publishes directives that governments and businesses are to follow. Directives move to address End-of-Life Vehicle, put restrictions on the use of hazardous substances, use of packages and e-waste handling. As such, regulations force actors in the product life cycle towards environmental take-back obligations and the arrangement of proper waste treatments (Rogers & Tibben-Lembke, 1999:138).

The WEEE-directive (Directive 2002/96/EC) is a directive adopted in the EU in 2003. WEEE is the acronym for Waste Electrical and Electronic Equipment. It has since been amended with the most recent revision in 2012 (Directive 2012/19/EU) (Directive, 2012). Products are listed according to category and are subject to the provisions of the directive. Table 2.1 shows the main categories. For an exhaustive list of product categories, refer to appendix 1.

Table 2.1 *– Product categories (Directive, 2012:53)*

No.	Directive 2012/19/EU WEEE categories
1	Large household appliances
2	Small household appliances
3	IT and telecommunications equipment
4	Consumer equipment and photovoltaic panels
5	Lighting equipment
6	Electrical and electronic tools
7	Toys, leisure and sports equipment
8	Medical devices
9	Monitoring and control instruments
10	Automatic dispensers

The WEEE-directive serves to regulate the handling of e-waste by making countries implement national legislation. It defines targets for collection, recovery, treatment and recycling (Goosey, 2004:41). Member states should develop necessary infrastructure to allow consumers to separate e-waste from municipal waste (Directive, 2012:40). Moreover, it aims to create a more harmonized framework for producer responsibility. Different interpretations and implementation of producer

responsibility create a situation where financial inequalities are present. Thus, it creates minimum standards that the whole union should follow for the treatment of e-waste (Directive, 2012:39).

Developed nations have focused efforts into creating an infrastructure capable of handling e-waste in a safe and secure manner. However, while in an ethical and legal gray area, exports of e-waste to developing nations such as India and China is common. This is true even though the Basel convention bans exports of hazardous waste (UNEP, 2011a). India has passed legislation banning the imports of e-waste. Common practice in developing countries is to label import products as reusable. This allows for circumvention of the ban (Manomaivibool, Lindhqvist & Tojo, 2007:17).

Extended Producer Responsibility (EPR) is a policy initiative designed to motivate greater producer responsibility for end-of-life product management. Producers should take responsibility for post-usage management of materials and products. The definition provided by the Organization for Economic Co-operation and Development (OECD) (OECD, n.d.) is commonly used:

> *…an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle. There are two related features of EPR policy: (1) the shifting of responsibility (physically and/or economically; fully or partially) upstream toward the producer and away from municipalities, and (2) to provide incentives to producers to incorporate environmental considerations in the design of their products.*

As seen in the definition, the primary purposes of EPR are to motivate the development of greener products and the internalization of the cost of after-life management. By forcing the producer to account for end-of-life fees in the production of the product, an upstream design change will be prompted (Tong & Yan, 2013:201). According to Lifset, Atasu and Tojo (2013:162) it signifies a shift, where burden is taken away from local municipalities and tax payers and moved to producers and consumers. Thus, EPR is a mechanism to shift the operational responsibility and cost of managing recycling of manufactured products. EPR has proved successful in certain areas. Primarily it has stimulated infrastructure development for recycling of products.

The WEEE-directive has made sure that EPR is linked to the management of e-waste. As it currently stands, discussions on e-waste now include discussions around EPR principles as well (Tong & Yan, 2013:203). However, according to Lifset, Atasu and Tojo (2013:163) several countries have struggled to find ways to effectively manage and implement electronic products under the umbrella of EPR. Criticism have been raised that EPR does not provide effective incentives for the creation of green designs. Therefore, Individual Producer Responsibility (IPR) has been proposed. IPR is an effort to make sure individual producers take responsibility, rather than as a collective group.

EPR usage has grown in developed nations around the world. However, in developing nations it is not practiced to the same extent. According to Tong and Yan (2013:203) it is difficult to export the EPR concept under its current form. This is partly because of the structure of global supply chains. Outsourcing of production services to developing nations is common. This means that local producers have little control over the products they make. Furthermore, common practice is for EPR to be implemented as an initiative by the central government. In countries such as India, with a large informal recycling sector (see section 2.5.2), this can pose a problem. Therefore, it is necessary to achieve active involvement of producers and move away from only legislative tools and mandatory fees (Manomaivibool & Vassanadumrongdee, 2011:201; Tong & Yan, 2013:203).

2.2.4 Economic Considerations

Companies continuously look for cost savings in production processes. The purpose of repair remanufacture and recycling is to regain the still incorporated value of a faulty or aged product. This further allows for a secondary market of overhauled products and materials. Used products can be sold to a fraction of the original production cost. This economical approach, where profits and cost savings are the main drivers, reflects how reverse logistics is approached in the USA (Fargher, 1996 cited in Fleischmann et al., 1997:3). As such, economic considerations have its foundation in profit realization. Companies' engagement in environmental issues are enhanced by the economic advantages that can be achieved through cost savings and a reduction of resources used in production. Therefore, it can be said that economic and environmental issues are more or less intertwined.

2.2.5 Reverse Distribution

Reverse distribution refers to the collection and transportation of used products and packages. It is normally carried out through the forward logistics channel, a separate reverse channel or through a combination of them both (Fleischmann et al., 1997:4). Pohlen and Farris (1992 cited in Fleischmann et al., 1997:4) state that the reverse channel can take several forms depending on the channel members' abilities and functions as it applies to recycling and remanufacturing processes. However, the issue of integrating both forward and reverse channels exists. Fleischmann et al. (1997:4) describe how three main aspects must be considered in order to create an efficient reverse distribution channel. This is further expanded below.

Identification of the Actors

First, the actors must be identified. The actors set significant constraints on the integration of forward and reverse distribution. The actors may naturally be from the forward channel (e.g. manufacturers, retailers and logistics service providers) or specialized third party logistics service providers (e.g. material recovery facilities and secondary material dealers).

Identification of the Functions

Second, the functions that have to be carried out in the reverse distribution channel must be identified. The functions that are normally carried out in the reverse distribution channel are: Collection, testing, sorting, transportation and processing (Pohlen & Farris, 1992 cited in Fleischmann et al., 1997:4). In order to efficiently manage a distribution network and find suitable locations for these functions, a distribution design needs to be formed. One important function of reverse distribution is the location of sorting and testing. There are tradeoffs related to this function. Early testing can mean a reduction in transportation, but often requires expensive equipment. Decentralized testing is often restricted to an irregular and initial check. The same is true for the sorting of the return stream. It is less expensive to sort the items at an early stage, close to the collection of items. However, this has a tendency to increase handling costs and decrease the transportation capacity utilization due to an early separation into distinct flows. Thus, customers today are encouraged to partly carry the responsibility of the sorting function. (Jahre, 1995 cited in Fleischmann et al., 1997:4) This is evident in the EU directive for e-waste, which imposes on member states to develop necessary infrastructure to allow consumers to separate e-waste from municipal waste (Directive, 2012:40).

Relation Between Forward and Reverse Distribution

The third aspect, as identified by Fleischmann et al. (1997:4), which must be considered, is the relation that exists between the forward and the reverse distribution channel. Recycling is often handled by specialized facilities which means that the products bound for recycling do not return to the original producer. Integration of forward and reverse distribution is difficult due to differences in the actors' abilities. Remanufacturing and reuse, however, is characterized by a more closed loop system where products are moved back to the original producer. Thus, the original network can be used for distribution, with support from specialized third party logistics providers. Nevertheless, an integration of the forward and reverse distribution channel is problematic at a routing level. This is because collection and delivery require different handling.

Figure 2.1 illustrates the different types of reverse distribution combined into one framework.

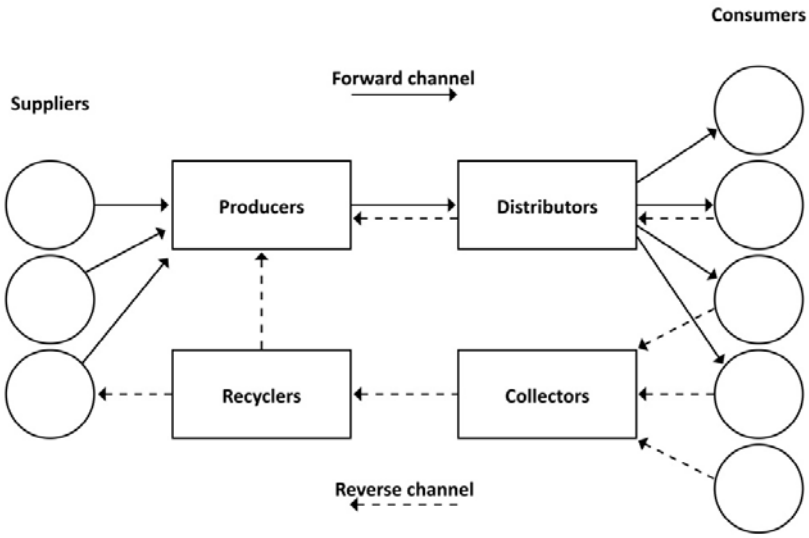

Figure 2.1 *– Reverse logistics network, adapted from Fleischmann et al. (1997:5)*

It is important to note that the reverse flow (illustrated by the dashed lines) can move through the forward network, as well as through a network used by third party logistics service providers and special facilities. As previously stated, this is due to the fact that remanufacturing and reuse is mostly handled by the original producers, while recycling and subsequent waste disposal is handled by external actors with particular capabilities required for the procedure.

2.2.6 Inventory Control in Return Flows

In order integrate the return flow of used products into producers' material planning an appropriate control mechanism is required. According to Fleischmann et al. (1997:7) traditional inventory management methods need proper assessment before usage. This is because these methods are dependent on the functions of the actors involved.

Specialized recycling is a branch where traditional inventory control methods can be applied. However, a different approach is needed if the products are bound to the original producers, for repairs or remanufacturing, as can be the case for the electronics industry. Here, spare parts can be produced by used products (Thierry, 1995:122). In this setting, the producer has two alternatives to meet the demand from customers. The producer can either order required materials from suppliers or overhaul used products and bring them back to *as new condition*. Thus, inventory control is

necessary. It controls the orders for external components vis-à-vis the internal component recovery process. This is done to guarantee a required service level and the minimization of fixed and variable costs.

As stated in section 2.2.1, products are returned for different reasons. Returns vary in timing, quality and quantity. As such, the producer can exercise only little control over the return flows. Fleischmann et al. (1997:7) describe how this has two effects. While it might decrease production costs in comparison to fabrication of new products, it also jeopardizes the reliability of planning due to increased uncertainty. The result of this may be the need for a higher safety stock level. A solution to this issue is to forecast the return rate through the use of models developed for this explicit purpose.

2.2.7 Production Planning – Reuse of Parts and Materials

Production planning for returned products shares some of the issues found in inventory control. Traditional production planning may not be suitable for returned products. According to Fleischmann et al. (1997:11) these issues are dependent on the specific form of reuse that is required. Direct reuse means no additional process is needed. The returned products can be used in the same condition as they are returned. Thus, the focus for this product category (pallets, bottles etc.) lies mostly on inventory and distribution-collection, rather than on planning of production.

Fleischmann et al. (1997:11) state that for recycling of material, other processes are needed. This is due to the transformation (melting, grinding etc.) of used products into raw material. However, these problems lie within the technical conversion into usable raw material, rather than in production planning and control of these activities. As such, it is not very different from other production processes. Therefore, traditional production planning methods are sufficient to plan and control the recycling.

However, remanufacturing may constitute a challenge. Remanufacturing requires individual product considerations. Furthermore, it may involve several interdependent activities. Therefore, efficient coordination of production and activity planning becomes vital (Lund, 1984 cited in Fleischmann et al., 1997:12). Remanufacturing requires that several tests are performed. Subsequent to this, the product has to be disassembled. Tests are needed due to the many different causes of failure that are possible. In contrast to traditional manufacturing, this shows how remanufacturing is an irregular and often time-consuming process. (Fleischmann et al., 1997:12)

In addition to uncertainty issues, the disassembly itself may cause further problems. Under a disassembly process, several parts are simultaneously released. If the same facility and equipment is used for disassembly, repair and subsequent remanufacture, as is used for production of new products, capacity issues may present itself. Due to this, the selection of a specific recovery option for a given product is vital. However, technical feasibility sets constraints on this selection. These constraints, therefore, need to be compared with their economic return. (Fleischmann et al., 1997:12)

2.3 External Factors

It is only when the strategy of a company matches that of the surrounding environment that a venture may thrive. Therefore, it is important to identify the external factors that have an effect on the development of reverse logistics. Figure 2.2 shows the external factors affecting the development of reverse logistics.

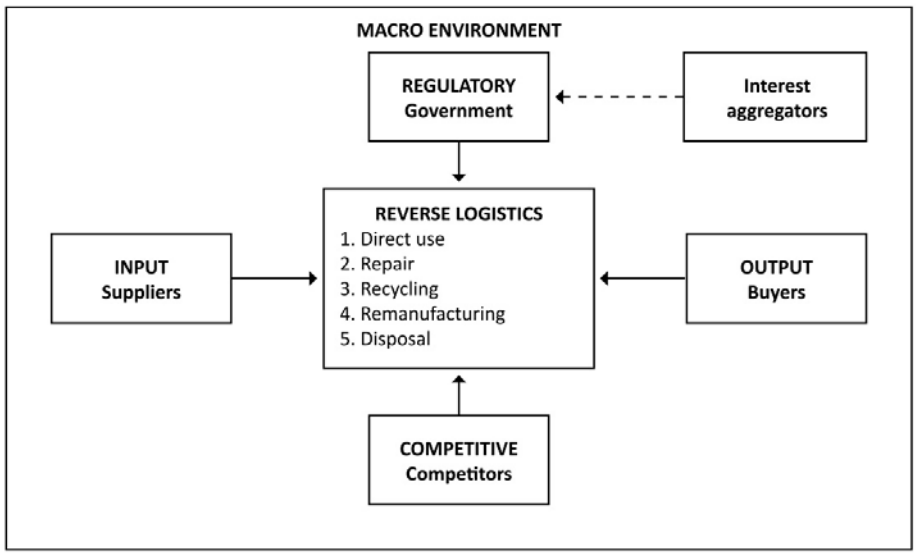

Figure 2.2 *– External factors affecting the development of reverse logistics, adapted from Carter and Ellram (1998:94)*

As shown in figure 2.2, external factors are separated into four categories: Competitive, regulatory, input and output. In research, legislation is often attributed most significance for the development of reverse logistics (Carter & Ellram, 1998:95). However, as stated in section 2.2.4, a drive to exert higher profits must also be taken into consideration. Moreover, consumer pressure is mounting. Thus, collaboration up and down the supply chain is important. Each factor is further explained next.

2.3.1 Competitive Factors

Competitive factors can be separated into two factors: Actions taken *by* competitors and actions taken *with* competitors. When a company implements innovations that serve to augment its reverse logistics processes this can pose a threat to other companies in the form of reduced competiveness. Therefore, companies can force each other to adhere to a certain standard as it applies to its offered services.

The other factor is how collaboration is used to leverage the efficiency of reverse logistics. In order for companies to realize cost savings through their reverse flow, it is often necessary to allocate certain volumes. According to Cairncross (1992:44), companies that isolate themselves to their own product assortment might not find it useful to devote attention to reverse logistics, economically or environmentally. Therefore, collaboration with competitors can contribute to the creation of more efficient reverse logistics systems. This can allow for allocation of volumes from different geographical areas. Customers may be spread geographically. In order to reach these customers, companies pool their efforts with their competitors. Another method to reach sufficient volumes in the reverse flow is to directly employ the services of a third party. This is a common approach in Sweden, where the producer organizations', El-Kretsen and Elektronikåtervinningsföreningen (EÅF),

administer producer responsibility and collection systems for producers and retailers (El-Kretsen, 2010; EÅF, 2014).

It should be noted that competitive factors are in literature not viewed as important for the development of reverse logistics as other factors (Carter & Ellram, 1998:95). However, as shown, actions by and with competitors do have an effect on the development of reverse logistics.

2.3.2 Regulatory Factors

Regulation is considered an important factor for the development of reverse logistics (Carter & Ellram, 1998:95). It forces companies towards a harmonized and often more efficient and effective reverse logistics system. Those companies disregarding relevant regulation are penalized (Cairncross, 1992:42). Regulatory factors are defined here as directives and decrees coming from national and supranational regulatory bodies.

As stated in section 2.2.3, the WEEE-directive is one example where regulation acts as a force for companies to develop reverse logistics systems or implement EPR practices. Furthermore, lobbying organizations, NGO's and other interest groups are necessary to consider, as they are in a position to influence the state of current and future legislation.

2.3.3 Input

Supplier collaboration is considered a vital factor for the development of efficient reverse logistics systems. However, collaboration with suppliers can be problematic. Companies with limited power may find it difficult to influence strategy and therefore, further issues in the supplier-buyer relationship are experienced. However, collaboration upstream in the supply chain is important if a company is to achieve efficiency in its activities. According to Ravi and Shankar (2005:1017) non-cooperation is a serious deterrent for implementation of reverse logistics. Cooperation and streamlining of processes will lead to greater efficiency.

2.3.4 Output

Output is the continuation of the supply chain, i.e. material and products bound for wholesalers, retailers, manufacturers and service providers etc. (Ho et al., 2012:33). Moreover, it covers the end consumer and the pressure these are able to apply. The product characteristic that consumers' chose as most important is dependent on several factors, but is often related to standard of living and other economic factors (Srivastava & Srivastava, 2006:525).

2.3.5 Macro Environment

As shown in figure 2.2, surrounding the other factors is the macro environment. This means that social-, political-, legal- and economic trends have an effect on the overall business climate. Moreover, available infrastructure also regulates the business climate. Therefore, it can be said that the macro environment is influencing the development of reverse logistics (Ravi & Shankar, 2005:1017).

2.4 Drivers

There are several reasons why reverse logistics has seen a growing interest during recent years. According to Ravi, Shankar and Tiwari (2005:331), there are four primary drivers behind reverse logistics development. These are: Economic factors, legislative factors, corporate citizenship and environmental issues.

2.4.1 Economic Drivers

Business is mainly done with the short or long-term aim to gain profits. Therefore, economic factors are by many seen as the main driver for reverse logistics (Poist, 2000:54). Companies continuously look for cost savings in their production processes. This can be done through the efficient management of resource reduction, by adding value from product recovery or reducing waste disposal (Ravi, Shankar & Tiwari, 2005:331). An example of this is how the US company ReCellular gained an economic advantage by refurbishing cellphones. ReCellular realized direct gains via input material, cost reduction and value added recovery. In addition, the company gained indirect advantages through a greener image and improvement in customer and supplier relations (Guide & Wassenhove, 2003 cited in Ravi, Shankar & Tiwari, 2005:331).

2.4.2 Legislative Drivers

The second driver for reverse logistics is legislation. According to Ravi, Shankar and Tiwari (2005:331), legislation concerns such laws that impose take-back obligations for companies after the end-of-life of a certain product. This includes collection and reuse, a shift of the cost for waste management to producers, a reduction of the generated waste volume and increased use of recycled materials. An example of this is how the WEEE-directive functions. The directive serves to regulate handling of e-waste and requires producers to internalize the cost of after-life management (Directive, 2012). Furthermore, restrictions imposed on the handling of hazardous substances regulate the safe dismantling and recycling of e-waste (Ravi, Shankar & Tiwari, 2005:331).

2.4.3 Corporate Citizenship

The third driver for reverse logistics is corporate citizenship. As stated by Ravi, Shankar and Tiwari (2005:331) this is mainly concerned with how company principles and values can induce a company to devote attention to reverse logistics. It is assumed that these principles will lead to an increased corporate image. An example of this is Nike. The company urges customers to return used shoes. The shoes are subsequently shredded, where basketball courts and running tracks are created (Rogers & Tibben-Lembke, 2001:23).

2.4.4 Environmental Issues

The final driver for reverse logistics is environmental concerns and green issues (Ravi, Shankar & Tiwari, 2005:332). The principles behind ecological footprint reflect greening initiatives in several countries (Hart, 1997:69). Thus, mitigation of environmental effects has seen a growing interest. Furthermore, as environmental awareness has increased, it has become essential for marketing purposes. This fact further urges organizations to explore new and efficient options for take-back and waste disposal (Murphy et al., 1995 cited in Ravi, Shankar & Tiwari, 2005:331).

2.5 Sweden and India – Main Characteristics

This thesis is a study on how reverse logistics applies to electrical and electronic products in Sweden and India. The following sections provide an overview of the current situation in these countries.

2.5.1 Sweden

Waste handling in Sweden is well developed. Historical development has created the necessary infrastructure and legislation that extends producer responsibility has been implemented (Nnorom & Osibanjo, 2008:849). Furthermore, recycling, as a concept, is well established within the minds of the population (Cairncross, 1992:40). This has created a situation where an encompassing framework is

present allowing for efficient reverse logistics. However, how companies chose to address reverse logistics is of course individual.

Lindqvist (2013:146) describes the situation in Sweden. Municipalities hold the overall responsibility for waste management. However, Sweden has followed the pattern of other countries in Europe, where outsourcing of public services to private actors has been seen. As such, public tendering applies to areas not within the area of municipal monopoly. Involved actors are the municipalities themselves, producers and end-users (possessors). Possessors have an obligation to allow for proper treatment. This essentially means that the possessor separates products into different categories and then deposits these at collection sites.

Municipalities in Sweden enjoy a certain freedom in their approach to waste management as long as it is in accordance with national and international legislation (Lindqvist, 2013:151). Since the implementation of producer responsibility legislation in the 1990's, municipalities' responsibility is limited to only such products not included in this category. E-waste is one of the waste categories affected by this.

E-waste falls under SFS 2005:209, with its latest revision in 2011 (Riksdagen, 2005; Notisum, 2011). This decree stipulates how producer responsibility applies to e-products in Sweden. Although producers are held responsible through this law, a producer responsibility organization often acts as the link between individual companies and municipalities. The result is that virtual responsibility falls back on the municipalities. This is because collection sites are provided by municipalities (Manomaivibool & Vassanadumrongdee, 2011:187).

The collection of e-waste can be separated into two universal channels. These are municipal collection sites and retailer take-back together with producer take-back (UNEP, 2011b:47). Municipal collection sites are where consumers leave e-waste at designated sites provided by the municipality. This type of service is cost effective and free to use for individual end-users. Municipal collection systems serve as the foundation for collection of e-waste in Sweden (UNEP, 2010:99). The second channel is product take-back by the retailer or producer. This activity can coincide with the delivery of a new product, e.g. a refrigerator and is then on a 1-to-1 basis. Consumers can also return used products directly to a retail store. EÅF is the Swedish organization primarily responsible for the administration of this flow (EÅF, 2014).

There are currently around 2,600 dedicated collection sites for e-waste around the country. These are a part of the network served by El-Kretsen. El-Kretsen is the producer organization responsible for coordinating logistics services for discarded e-products through their collection sites. Their mission is to help producers fulfill their producer responsibility through a nationwide collection network. As such, this system works in tandem with local municipalities and authorities. (El-Kretsen, 2010; UNEP, 2011b:99)

In line with EPR legislation, producers are required to finance the take-back of products. This means an internalization of the costs associated with a product's after-life is done. Through a membership in an organization, such as those aforementioned, it is possible for a producer to leave this to the organizing body. El-Kretsen and EÅF both offer the financial services that are necessary to fund a product's after-life (El-Kretsen, 2010; EÅF, 2014).

2.5.2 India

Reverse logistics in India is still in its initial stages. This can be compared to the situation in Europe and North America where development has come further. As has been stated, different driving forces are behind the advancements in Europe and North America. In Europe, reverse logistics is driven by regulatory measures imposed by supranational and national legislation (Nnorom & Osibanjo, 2008:844), whereas development in North America is primarily driven by profit mechanisms (Srivastava & Srivastava, 2006:525).

However, Srivastava and Srivastava (2006:525) argue that the situation in India and other non-OECD countries will change. Globalization and growth in consumer awareness will create a situation where increased attention to reverse logistics processes will be necessary in the future. Nevertheless, both producers and consumers in India are still more sensitive to price, and less to quality and environmental aspects of products (Srivastava & Srivastava, 2006:525; Sinha-Khetriwal, Kraeuchi & Schwaninger, 2005:498).

Waste management and recycling in India has evolved over time and in line with development of new technology. The large and uncoordinated scrap industry has evolved to handle new forms of waste. The current debate focuses largely around the handling of e-products (Sinha-Khetriwal, Kraeuchi & Schwaninger, 2005:500).

Manomaivibool, Lindhqvist and Tojo (2007:11) separate the handling of e-waste in India into three segments. The first segment is the second-hand marketplace for electrical and electronic equipment. This is where products are sold for reuse. This is often dependent on spare parts stemming from e-waste. The second segment concerns post-consumer activities. Higher value products are often traded in when acquiring new products or sold in bulk if used by corporations. Products with less value are sold to scrap collectors or treated as municipal solid waste (MSW). The third and final segment is the treatment of the waste itself.

According to Manomaivibool, Lindhqvist and Tojo (2007:11) this is largely handled by an informal and *disorganized* sector. The disorganized label should be used with discretion. The informal sector is often characterized by intimate relationships and well-functioning structures one tier up or down in the supply chain. The primary objective of this sector lies in recovering usable materials and components for reuse or selling to secondary markets. Around 95 percent of the generated e-waste is funneled into the informal sector (Bhowmick, 2011; Raghupathy et al., n.d.). An estimation of the number of people employed in the sector is hard to give, given its informal nature. Driven out of poverty, the low initial investment enables the startup of small and medium enterprises with collection, sorting and recovery as its functions (Sinha-Khetriwal, Kraeuchi & Schwaninger, 2005:500). The people employed in the informal sector work with hazardous material without protective clothing which leads to physical injuries. Furthermore, the extraction of metals like gold and copper in open acid baths, releases toxins and contaminates the water and soil (Raghupathy et al, n.d.). As such, the scale of this informal industry and its implications cannot be overlooked when contemplating the development of a more formal system.

However, there are efforts to move volumes away from the informal sector. In 2011, the Indian government established a recycling plant in Bangalore equipped to handle 60,000 tons of e-waste annually (Bhowmick, 2011) and there are several formal recycling companies that have now begun to offer their services (EIA, 2014). Even so, to move volumes away from the informal sector is a difficult

task to complete. Consumers are paid by collectors for their waste (Bhowmick, 2011). These collectors and scrap dealers go door-to-door, while formal actors are unable to offer similar rewards (Raghupathy et al., n.d.).

Legislation regulating the handling of e-waste is published by the Ministry of Environment and Forests (MoEF) under the e-waste (Management and Handling) Rules, 2011 (MoEF, 2011:27). The rules have been formulated in accordance with EPR practices (MoEF, 2011:29). The purpose of the rules is to provide the basis for subsequent legislation and the development of the legal framework. According to Raghupathy et al. (n.d.) this is important as it enables the formation of a sound e-waste management system in India.

The rules call for registration of all actors involved in collection, dismantling and recycling processes, irrespective of whether the actor belongs to the informal or formal sector. The rules also call for collection of waste at a collection center or a specified channelization of the e-waste, as stated by the recycler (Raghupathy et al., n.d.). However, even with regulations in place there are questions as to whether the authorities are able to enforce them (Sinha-Khetriwal, Kraeuchi & Schwaninger, 2005:498). The rules are simply enabling a more sound treatment of e-waste. New investments and participation from formal actors are needed (Raghupathy et al., n.d.)

The rules list duties for each level of government. This ranges from the duties of the Central Control Board in New Delhi, to State Pollutions Boards/Committees of Union Territories, to urban local bodies. List of duties range from training and awareness programs; incentive programs for green design products; authorization; registration of recyclers; actions against violations; and the proper segregation of e-waste and MSW at the most local level (MoEF, 2011:40).

However, according to Manomaivibool, Lindhqvist and Tojo (2007:16) India is missing a collection infrastructure that is capable of sufficiently handle e-waste. This is confirmed by the former environmental minister who describes the infrastructure for e-waste treatment as insufficient (Bhowmick, 2011). It is only recently that private actors have now begun to realize the market potential for recycling of e-waste (EAI, 2014). As such, infrastructure development for collection and recycling has started. However, it is not certain that even with greater capacity that a controlled e-waste handling would succeed, given the competition from the informal sector. As the informal recycling sector is characterized by lower environmental standards and a disregard for work place conditions, more controlled processes would have to compete on efficiency (Manomaivibool, Lindhqvist & Tojo, 2007:16).

Future Reverse Logistics Development in India

India is one of the largest markets in the world and thus attractive for businesses. However, the absence of consumer pressure has created a situation where reverse logistics is not prioritized. Indian consumers are more sensitive to price and less to environmental and quality aspects of products (Srivastava & Srivastava, 2006:525). Thus, focus of producers is placed on growth and achieving low cost and less on the after-life of products.

However, a growing awareness of environmental issues and increase in standard of living will pressure companies to take greater responsibility of its products. As mentioned in sections 2.4.3 and 2.4.4, corporate citizenship concerns and environmental issues are two of the main drivers for

reverse logistics. Therefore, implementation of reverse logistics networks and activities may lead companies to developing a competitive advantage (Ravi, Shankar & Tiwari, 2005:328).

However, it is imperative that this development is supported by government initiatives. A lack of incentives and disincentives from authorities would solidify the situation of non-development (Srivastava & Srivastava, 2006:525). Subsidies from the government may help stimulate development (Ho et al., 2012:33). Furthermore, individual attempts at product recovery are not effective. Instead, companies should pool their efforts with other companies in order to generate the necessary volume of take-backs (Ravi, Shankar & Tiwari (2005:337).

2.6 Summary of Theory

After a review of existing theory it is evident that reverse logistics is a topic that is well researched. Since its conceptual birth in the 1980's, companies have more and more come to realize and appreciate the values attributable from having a formalized reverse logistics process (Hazen, Hall & Hanna, 2012:245). The growing attention it receives is attributable to four primary drivers. These are economic drivers, legislative drivers, corporate citizenship and environmental considerations (Ravi, Shankar & Tiwari, 2005:331). It has been shown that these drivers push companies into developing efficient reverse flow of their products. However, it has also been shown that they drive development for different reasons.

Economic considerations are responsible for streamlining reverse logistics processes and value recovery efforts. Regulatory initiatives mandate that producers take greater responsibility of the after-life management of products and force companies to adhere to stricter environmental legislation. Corporate citizenship is a chance for companies to enhance their corporate image through reverse logistics processes and after-life product management (Rogers & Tibben-Lembke, 2001:23). Environmental considerations, intertwined with economic drivers and corporate citizenship, force companies – often via consumer pressure – to take environmental concerns into account (Murphy et al., 1995 cited in Ravi et al., 2005:331).

External factors as identified by Carter and Ellram (1998:94) have been used as the framework for which the subsequent analysis is based. External factors are defined here as competitive- and regulatory factors, input, output and macro environment. These are non-company specific factors that in different ways act as prerequisites for the development of reverse logistics.

In order to familiarize the reader with the concept of reverse logistics, different dimensions, as they are defined in research, have been described systematically. This review is primarily based on the work of Fleischmann et al. (1997) and has covered definitions of product categories; different forms of reuse; environmental and economic dimensions; as well as issues associated with reverse distribution, inventory control and production planning. From this review it is possible to appreciate how reverse logistics differs from traditional forward logistics and the issues associated with it.

The theory chapter is lastly concluded with a description of the situation in Sweden and India. From this it is possible to learn that reverse logistics in Sweden is much more developed and act under different prerequisites compared to India. However, how these different prerequisites affect the prospect for growth of reverse logistics in India is left to the analysis chapter of this thesis. As such, the section only concludes that differences do exist and that external factors have had a large impact

on historical development, continue to impact current development and will guide development in the future.

As shown from the review of relevant theory, it is possible to appreciate the problems associated with the after-life management of e-products. How this product category should be handled has been a topic addressed by many researchers. As such, we intend to contribute to this field, by contrasting the situation in Sweden with that of India. Through the use of empirical material, and based on presented theory, this study will show how external prerequisites affect the development of reverse logistics for e-products.

3. Methodology

This chapter will describe the research philosophy, research design and the methods that were employed. This is subsequently coupled with a discussion on the quality of the results.

3.1 Research Philosophy

This thesis is a qualitative study. Qualitative research is concerned with the development of new theories. Theory generation is made possible through observations of the world. Qualitative research is closely associated with interpretivism. Interpretivism can be described as an inductive process. The goal is to gain an interpretive understanding of a phenomenon in a specific context (Collis & Hussey, 2009:57). This means that reality is dependent on both the world view of the researcher, as well as activities and views of the observed subject. As such, an interpretation of the social construct in which the respondents' function is necessary.

It should be noted that it is possible to apply both quantitative and qualitative research methods in the same study. This approach can ensure a more holistic understanding of the phenomena as the merits of both approaches can act complementary (Collis & Hussey, 2009:7). However, such an approach is usually reserved for larger studies and is not something employed here.

However, even though this research adheres closely to interpretivism, the research process has not only been inductive. During the initial phase of this thesis, a deductive approach was required. This approach let the researchers get acquainted with the topic and allowed for the creation of the theoretical framework. Subsequent to this, however, the primary data collection was driven by an inductive process where interview material serve as the foundation on which the analysis rest.

3.2 Research Design

The research design is the framework that guides the research. Research objectives are dependent on the chosen design. It is through an appropriate design that an answer to the research questions and fulfillment of the objective is possible (Adams et al., 2007:81). Therefore, the chosen research strategy is intrinsically linked to the research questions. This further means that a good understanding of different research design characteristics is necessary.

Figure 3.1 describes the general steps we took in designing our research.

Figure 3.1 *– Research design process*

It is important to note that the research design has been subject to revision as the research progressed. This is not something unique for this study, but a common phenomenon in qualitative research (Collis & Hussey, 2009:111). This can be exemplified with how the researchers gradually gained an increased understanding of the topic at hand. In turn, this allowed for a more precise problem formulation with a modified purpose and research questions.

The purpose of this thesis is to study how external prerequisites affect the development of reverse logistics for e-products. This is done through exploratory research. Exploratory research is appropriate should there be few earlier studies available (Collis & Hussey, 2009:5). As such, it can be used if the researchers only have limited knowledge or information on the subject. While reverse logistics in itself is an area that is well researched, the contrasting nature of this thesis makes an exploratory approach suitable. Furthermore, an exploratory approach allows for a more dynamic research process. One of the biggest benefits of an exploratory research design is the possibility to adapt the study due to data availability, change in circumstances or similar occurrences. It should be noted that different research designs tend to overlap. Most research will contain several research design aspects (Adams et al., 2007:20). Therefore, this study share some of the characteristics found in a more descriptive research design.

This study is not concerned with solving a specific local issue. Instead it aims to offer explanations and provide a broader guiding framework within the context of reverse logistics development. This means that this study is similar to basic research (Collis & Hussey, 2009:7). By itself, it is more of a theoretical work. However, the knowledge generated through the employed research design may act as solutions to problems in the future.

3.3 Data Collection

3.3.1 Primary Data

Primary data are new data from an original source (Collis & Hussey, 2009:23). Primary material in this thesis stem from two sources: Interviews conducted via telephone and interviews conducted through a questionnaire, sent by e-mail. E-mail interviews were in some cases necessary. Respondents can be more inclined to accept interview requests if e-mail correspondence is allowed. There are several reasons for this. Finding time to sit down may be problematic. E-mail offers more flexibility. Moreover, respondents may prefer to answer in writing, since it allows for more thoughtful answers and eliminates the pressure a spoken interview may have. However, there are shortcomings to this approach as well. As such, a discussion on how research quality is affected by resorting to e-mail interviews is given in section 3.5.

The spoken interviews were of a semi-structured nature. This type of interview method was deemed as suitable, given the nature of the subject. According to Easterby-Smith, Thorpe and Lowe (1991 cited in Collis & Hussey, 2009:144) unstructured or semi-structured interviews are appropriate for situations when it is necessary to gain an understanding of the construct that forms the reality of the respondent. Furthermore, sensitive subjects are better handled in this form. The semi-structured interview allows for follow-up questions and gives respondents a chance to elaborate (Collis & Hussey, 2009:145). As such, it allows for a more holistic representation where higher quality results can be expected. A predetermined structure ensures that no topics are forgotten and that all relevant areas are covered. The structure used for each interview can be found in Appendix 2. Table 3.1 shows an overview of the selected respondents along with the dates of the interviews.

Table 3.1 *– Overview of the conducted interviews*

Company	Respondent Position	Language	Type	Date
RBAI	Consultant	English	Telephone	2014-03-07
Stena Technoworld	Marketing Director	Swedish	Telephone	2014-03-10
EÅF	Project Manager	Swedish	Telephone	2014-03-12
El-Kretsen	Marketing Director	Swedish	E-mail	2014-03-13
GT Nexus	Senior Analyst	English	E-mail	2014-04-01
RBDS	Manager	English	E-mail	2014-04-10

A more thorough presentation of the respondents and their organizations is given in section 4.1.

The nature of reverse logistics made it important to get perspectives from different viewpoints. However, this also meant that it was difficult for one respondent to answer all questions. Therefore, the questions were tailored to each respondent's respective area.

In Sweden, reverse logistics development is primarily driven by legislation. This means that attention is focused on minimizing the negative impacts associated with e-waste. As such, we elected to interview respondents that would be able to provide perspectives on an area where Sweden has become one of the leading nations in the world, i.e. material recovery and recycling. This is also an area where one of the biggest differences between Sweden and India are seen.

In India, estimations stipulate that more than 95 percent of the e-waste makes its way to the informal sector. Therefore, a generic description, similar to the situation in Sweden, is not possible. Less attention is given to the environmental impact associated with e-products. Instead, profit mechanisms act as the main driver. Therefore, the views of producing companies will allow for identification of the factors that are important for the development of reverse logistics in that context. This is coupled with a more general depiction where an overall portrayal of the situation in India facilitates the subsequent comparison between the two countries.

3.3.2 Secondary Data

Secondary material is material retrieved from an already existing source (Collis & Hussey, 2009:23). Secondary material in this thesis stem primarily from printed books, e-books, journal articles, company documents and other web sources. It is important to bear in mind that this is material compiled and prepared by persons with own agendas. As such, a critical approach to its reliability is necessary. Secondary data serve as the foundation for the theoretical framework. However, it is also referred back to in the later chapters.

A review of existing literature was an integral part of this research. A literature review is an evaluation of the current knowledge on a given subject (Collis & Hussey, 2009:100). Dowlatshahi (2000:145) states that reverse logistics research predominantly focus on five categories: (1) the basic concepts of reverse logistics and an overall summary of the subject itself (e.g. Rogers & Tibben-Lembke, 2001); (2) more quantitative research with models for forecasting returns and extension of product life cycles (e.g. Fleischmann et al., 1997); (3) how material handling, distribution,

transportation and warehousing is affected by reverse logistics processes (e.g. Fuller, Allen & Glaser, 1996); (4) how the profile of a company can affect the development of reverse logistics (e.g. Thierry et al., 1995) and finally (5), research into how manufactured products affect and influence reverse logistics (e.g. Kroon & Vrijens, 1995; Thierry et al., 1995).

A broad preliminary literature review was conducted in order to gain a better understanding of the topic. This review was done using databases provided by the university library. Keywords used for this search was *reverse logistics*, *reverse distribution*, *reverse logistics development*, *reverse logistics dimensions* etc. Subsequent to this a more precise search was possible. This let the researchers identify previous research within a narrower context.

3.4 Data Analysis

During the interviews, one person asked questions and led the discussion. This allowed for the other person to take notes. Shortly after the spoken interviews the notes were revised. The interviews were transcribed a short time after each interview session. This was done to ensure that the gathered data as far as possible would reflect the views of the respondent. The interview questions are based on the framework found in section 1.3 where the research questions are broken down. The breakdown of the research questions into concrete variables allowed for more precise formulation of interview questions. Material retrieved from respondents were subsequently compared to theory and contrasted with answers given by other respondents. This was done to ensure a thorough analysis of both empirical material and theory.

3.5 Research Quality

Prior to the spoken interviews, the questions were read by the supervisor and subsequently improved if this was deemed as necessary. A test interview allowed us to test the questions and identify potential issues. The prepared questions were sent to the respondents in good time before the interviews. This was done to allow for the respondents to familiarize themselves with the questions and thus provide better answers.

At the beginning of the interviews, the respondents were asked whether they had any questions about the format or a specific topic. The authors started the interviews with an introduction. This introduction further explained the intentions behind the research and cemented the context of the thesis. At the end of the interview, the respondents were again asked whether they had any questions or if they felt the need to address additional aspects.

Some interviews had to be conducted via e-mail. This can mean that the quality of the material suffers. As such, it is important that the stated questions are not possible to misinterpret and that the respondents have a clear understanding on what the researchers mean with each question. This is necessary since there is only a limited possibility for clarification or follow-up questions. Therefore, prior to the interviews, questions and topics for discussion were discussed with the supervisor. This second opinion ensured formulation of more precise questions. A test interview ensured that the possibility for misinterpretation was further mitigated.

3.5.1 Validity and Reliability

Validity is used as a measurement to identify how well research truthfully portrays what is studied. Coolican (1992 cited in Collis & Hussey, 2009:65) describe it as:

An effect or test is valid if it demonstrates or measures what the researcher thinks or claims it does.

Low validity can stem from several causes. Poorly designed research procedures or misunderstood questions can reduce the validity of the study. Studies conducted under an interpretive paradigm generally have a high validity (Collis & Hussey, 2009:65). This is due to its goal of capturing the knowledge of the persons involved. However, it is necessary to ensure that the respondent have the same interpretation of the questions and topics as the researchers.

The validity of the research can be assessed in different ways. Collis and Hussey (2009:65) describe two ways. The first one is face validity. This reflects back on the definition above, i.e. ensuring that the test represent what the test is meant to represent. The second is construct validity. This stipulates that there are phenomena that are not observable, but which can explain the observed phenomena. Such phenomena can be e.g. nervousness, stress or boredom. The use of e-mail questionnaires in this study removes the ability to account for such hypothetical constructs.

As such, e-mail questionnaires can reduce the validity of the study. This primarily stem from potentially misinterpreted questions and hypothetical constructs that have not been accounted for. While steps have been taken to mitigate the possibility for misinterpretation (see section 3.5), certainties cannot be given that the researchers have been successful.

Collis and Hussey (2009:64) refer to reliability as the ability to repeat the experiment and achieve the same results. In a qualitative study, reliability is of lesser importance and harder to achieve. This is because each situation is unique and the settings are hard to replicate. Instead, emphasis is placed on the legitimacy of the results. Therefore, how relevant procedures and protocols have been employed in the study is important.

To account for this, minutes and transcripts from meetings and interviews are kept for future reference and the guidelines used in interviews can be found in appendix 2. This means that the process that has led to formulate our subsequent conclusions can be traced. Therefore, it is our belief that if another researcher should attempt to recreate this study, with a comparable approach, similar results would be achieved.

3.5.2 Potential Weaknesses

It is important to recognize the potential weaknesses found in this study. While the interviews reflect the views of the respondents, they are also restricted to their views. This means that it is difficult to know whether the information can be generalized. In order to achieve more generalizable results, the study could benefit from a larger sample, perhaps even a more quantitative approach.

The unfamiliar environment of India can make it difficult for both authors to fully grasp and interpret the views of the respondents. As such, it is possible that nuances are missed or misinterpreted, which in turn lowers the quality of the study. Efforts to mitigate this impact are through a clear understanding of the topic; in addition to one of the authors being more familiar with India than the other. Nevertheless, this could potentially constitute a weakness.

4. Empirical Findings

This chapter will provide a compilation of the empirical findings. This review is based on the primary data collected through interviews. This is supplemented with data from company websites and reports. The chapter starts with a short description of the organizations that were interviewed. This is followed by the material extracted from the interviews. The data presented in this chapter are further analyzed in the subsequent analysis chapter.

4.1 Respondents

The respondents that were interviewed are involved in or have knowledge of, reverse logistics processes as it applies to their specific area. To a certain extent, the perspectives of the respondents are bound to be influenced by their line of profession. Therefore, a presentation of the different organizations' functions and responsibilities is given next. This is done so that the context in which the respondents function is made clear.

Trade Association – Elektronikåtervinningsföreningen

EÅF was founded in 2007 and presently has 54 members. Many of these members are large retailers of e-products, such as Siba and El-Giganten. The organization helps companies fulfill their producer responsibility. The companies connected to EÅF are not present in each municipality. In those situations consumers are forced to use the collection centers managed by El-Kretsen. Therefore, there is a close collaboration with El-Kretsen. (EÅF, 2014) The interviewed respondent is Project Manager Isak Öhrlund.

Trade Association – El-Kretsen

El-Kretsen was founded in 2001. El-Kretsen's purpose is to manage the flow of e-waste and help producers fulfill their producer responsibility. This is done through a nationwide collection system. The municipalities in Sweden are served with collection centers where people can deposit used e-products. The waste is then transported to specialized facilities for recycling. El-Kretsen is the owner of this flow. The organization is owned by 21 trade associations. These make up a large portion of the producers of electronics in Sweden. El-Kretsen has achieved what can be characterized as monopoly in the Swedish market. It has negotiated an agreement with all 290 municipalities of Sweden. (El-Kretsen, 2010) The interviewed respondent is Marketing Director Mårten Sundin.

Recycling Company – Stena Technoworld

Stena Technoworld (Stena) was founded in 1992. It is a branch of Stena Metall, which is a part of the Stena sphere. Stena specializes in recycling of e-products. The company has offered recycling for e-waste even before the implementation of the WEEE-directive. The company has long experience and has achieved a great credibility in the Swedish market. Stena is the Swedish market leader in the electronic recycling segment. The company has current agreements with both El-Kretsen and EÅF. In addition to this, Stena also manages the waste flow from smaller companies and organizations. (Stena Technoworld, 2014) The interviewed respondent is Marketing Director Johan Herrlin.

Producer – Robert Bosch Engineering and Business Solutions India

Robert Bosch Engineering and Business Solutions India (RBAI) is part of the Robert Bosch GmbH group. The group is the world's largest supplier of components to the automotive industry. RBAI is engaged in the production of industrial equipment such as drilling machines and metal cutting

machines, as well as larger products, testing equipment and jet cleaning machines. (Bosch, 2014) It is located in Bangalore, India. The interviewed respondent is RBAI consultant Syed Nawaz.

Supply Chain Professional – Pavan Murthy

Pavan Murthy is a supply chain professional with ten years of experience in consulting and managing supply chain initiatives in India. His expertise covers the automotive-, logistics- and healthcare sectors. Presently, he acts as a business process consultant for SME's and senior analyst for GT Nexus, a company that supplies a cloud-based platform for supply chain processes.

Producer – Robert Bosch Diesel Systems

Robert Bosch Diesel Systems (RBDS) is another division of Robert Bosch GmbH which mostly serves the automotive industry with diesel components (Bosch, 2014). It is located in Bangalore, India. The interviewed respondent is Manager Arvind E.

4.2 Overview of Sweden and India

4.2.1 Sweden

As stated in section 2.5.1, waste management in Sweden is a well-developed and structured process. Recycling is not a new phenomenon and is instead well-established within the minds of the population. This is further supported by interview material. When asked how Sweden has, in many aspects, become the leader in recycling and waste management processes, the respondents talk about tradition and environmental awareness.

Sundin (2014) states that Sweden has had a long tradition of recycling different materials and that traditional recycling, such as recycling of paper, cardboard and glass, has facilitated the recycling of electrical and electronic products as well. Furthermore, an environmental awareness of the hazards associated with e-waste was present even before the implementation of WEEE-legislation. According to Herrlin (2014) this awareness manifests as a willingness of the Swedish people to deposit waste at designated municipal collection sites or other available collectors, closer to the residence.

Pressure from consumers and the environmental awareness has stimulated companies to engage in recycling. Sundin (2014) exemplifies this with how companies such as Stena, Boliden and Kuusakoski have developed processes that safely and efficiently recycle waste with the intent of generating profit. The willingness of companies to engage in these processes should not be underestimated. The infrastructure used for collection is only part of the answer. Waste also has to be properly processed. This is done by specialized companies, such as those aforementioned. Valuable materials are extracted in a safe way and the waste is treated so as to lower its environmental impact. Extracted materials are subsequently used again in production. Stena, with its subsidiary Stena Technoworld, was the first company to engage in e-waste recycling in Sweden (Herrlin, 2014).

Swedish legislation requires that at least one municipal collection site for waste is available in each of Sweden's 290 municipalities. According to Öhrlund (2014) this requirement, with infrastructure already present, facilitated the development of efficient collection systems for e-waste as well. All that was needed for consumers to deposit their e-waste was the segregation of waste into an additional fraction.

When asked to compare the Swedish system to that of other countries, the respondents characterize it as efficient and well-functioning (Herrlin, 2014; Sundin, 2014; Öhrlund, 2014). Other similarly

developed countries typically have several collection systems where no cooperation between the systems exists. This means that consumers are forced to visit several sites to deposit their products. Therefore, the efficiency of the collection system is reduced. Sundin (2014) raises Norway as an example. In Norway there are several competing systems which create the need for more collection sites and therefore the need for more transport from the collection sites. Herrlin (2014) states that the situation in Denmark is similar. Three actors, comparable in size and function to El-Kretsen, run the system. The Danish system is opposite to the Swedish system. Instead of one principal actor responsible for the flow, the individual recycler is responsible and duties are handed over to that actor. This creates the need for a middleman. In Sweden, since El-Kretsen is in charge of the transport and the entire flow, it is possible to negotiate a more cost-efficient solution. In Denmark, three actors have to negotiate on individual terms. As such, the structure that determines how the collection system is managed is important. This structure must be neutral in terms of competition and allow for fair market conditions (Öhrlund, 2014).

However, the Swedish system also results in a trade-off between efficiency and control. From the perspective of recycling companies, the Danish system is more favorable. According to Herrlin (2014) the Swedish system means that recycling companies lose the ability to control the flow of waste. Flows can vary in both size and timing. This makes it harder for recyclers to plan for a specific amount and manage the waste that do arrive. Recycling companies are required to accept the waste that arrives at their facilities whether it is convenient or not. Nevertheless, the cost per kilogram of collected and recycled products is significantly lower with the Swedish system compared to the mentioned neighboring countries. Improvement areas of the Swedish system are further discussed in section 4.5.

Two Primary Collection Systems in Sweden

The Swedish collection system for e-products is separated into two primary flows. The largest flow is the flow from the municipal collection sites. This is the flow managed by El-Kretsen. The second flow is business-to-business (B2B), e.g. the flow from retail stores or other industries. A generic description of the Swedish collection and recycling system, based on interview material, is given in figure 4.1.

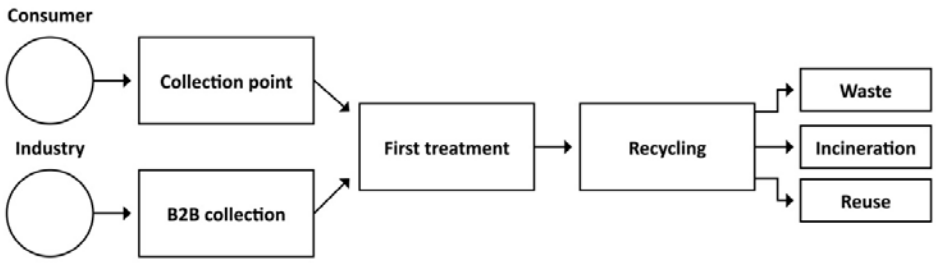

***Figure 4.1** – Swedish collection system*

E-waste primarily stem from the two flows shown in figure 4.1. As seen, the flows converge at first treatment where materials are segregated and subsequently recycled as far as possible. Hazardous waste is separated from the material bound for reuse or incineration for energy purposes. A step by step description of the primary flows is given next.

Municipal Collection

Around 98 percent of the collected waste is collected through El-Kretsen's collection sites. El-Kretsen rents space at the collection site from municipalities. The fee is based on a per-kilo of collected electronics. El-Kretsen has contracts with all 290 municipalities in Sweden. (Öhrlund, 2014) Sundin (2014) describes the process. The process starts when waste is deposited at the collection site. This is done in containers, bins or other receptacles made available for this purpose. Once full, the load-carriers are then transported to first treatment facilities managed by recycling companies. The load-carriers are all equipped with an ID. This ID enable tracing during transport and ensure that nothing gets lost. El-Kretsen is the owner of the logistical operation (Herrlin, 2014).

Sundin (2014) further states that the products that are processed at first treatment are reported back to El-Kretsen. The reported volume is then used for annual statistics. The reported volume is allocated to producers in accordance with what they have placed on the market. This reporting is essential, since each producer is required by law to declare this to the Swedish Environmental Protection Agency.

According to Herrlin (2014) the large volumes enable a high level of efficiency. From the municipal collection site, transports can be conducted with full-truck-loads. Once the waste has been segregated, processed and recycled as far as possible, the extracted material, primarily different metals, can be sold to raw material dealers or directly to producers for use in production of new products.

B2B Collection

The second flow is the B2B-flow. Consumers have the possibility to deposit e-products at certain retailers, such as Siba and El-Giganten. Siba and El-Giganten are both connected to EÅF (EÅF, 2014). According to Öhrlund (2014) around 30 percent of the products that are placed on the Swedish market stem from producers that are part of EÅF and only seven percent from producers that are connected to El-Kretsen. This creates a misallocation between the two actors. How this is handled is further explained in the next section. Once the products have been collected, they follow the same process as products that are collected at municipal collection sites. Products are transported to first treatment and recycling facilities. The products are segregated, processed and recycled as far as possible. Extracted material is subsequently used again in production.

Companies can also have direct contact with recycling companies. Herrlin (2014) states that these volumes are dispersed and not as large as the other collected volumes. However, the system is still described as efficient. The collection from smaller enterprises can be managed directly by recycling companies. For example, Stena offers to manage the entire process, from transport and administrative tasks to the actual recycling. This means that individual companies can devote a minimum of attention to this issue. All that is needed is an agreement with a recycling company. E-waste is inherently of low value. Therefore, efforts are made to ensure that no extra transport is created. Transports are instead conducted with free capacity, thereby minimizing the environmental impact.

Clearing between El-Kretsen and EÅF

According to SFS 2005:209, a producer is by law required to make the collection of a product available for the consumer (Notisum, 2011). However, since certain companies connected to EÅF are not present all over Sweden, collaboration between El-Kretsen and EÅF is necessary. El-Kretsen is

present in all of Sweden's 290 municipalities. As stated, the amount that is collected by El-Kretsen is around 98 percent of the total volume. However, as also stated, the companies connected to EÅF place around 30 percent on the market. As such, a misallocation is present. Therefore, there is a need to determine the amount payable between the two organizations. This is referred to as clearing and is done four times a year and is based on sales statistics. (Öhrlund, 2014)

4.2.2 India

The respondents in India place their focus on different areas compared to respondents in Sweden. This is due to the different environment where weight is placed on issues that are perceived as important in the Indian context.

In India, the focus of reverse logistics is still predominantly on profit mechanisms and less on issues related to the actual waste treatment of e-products. As such, reverse logistics activities in India focus more on activities that have a chance to result in cost savings for companies and organizations. This approach is more similar to how reverse logistics is viewed in North America, compared to Europe, where legislation is the primary reason for companies to devote attention to it. This assumption is confirmed by the respondents. The economic driver is identified as one, if not the most, important driver (Arvind, 2014; Murthy, 2014; Nawaz, 2014).

It is difficult to provide a generic depiction similar to the Swedish situation. There are several reasons for this. As was stated in section 2.5.2, a formalized and complete structure, similar to the situation in Sweden, does not exist for collection and proper recycling of e-waste. Instead, India is characterized by its informal sector involved in collection and material recovery. In an effort to address this issue, legislation is now aimed to develop means to achieve a greater share of recycling and proper waste management. However, as also stated in section 2.5.2, there are questions as to whether available infrastructure and facilities for this purpose is sufficient and whether a more formalized venture is able to compete with the informal sector (Manomaivibool, Lindhqvist & Tojo, 2007:16).

4.3 Reverse Logistics in Relation to External Factors

How companies and organizations chose to address reverse logistics activities is dependent on different prerequisites. As stated in section 2.3 these are competitive- and regulatory factors, input, output, together with the overall macro environment. How these affect reverse logistics processes, as elaborated by the respondents, is described next.

Competitive Factors

While none of the Swedish respondents explicitly mention competition as a prerequisite for reverse logistics processes, it is clear that collaboration in various trade associations is for a purpose. Law requires that producers account for collection and recycling. Therefore, it is in the actors' best interest that this is done as efficient and effective as possible. Sundin (2014) states that it would be nearly impossible and very expensive for one producer to handle its own collection system, whereas Öhrlund (2014), states that the administrative and logistical task for a separate system would complicate the management and require vast amount of resources. This fact prevents individual actors from engaging in a separate system.

It is for the reasons listed that companies join trade associations such as El-Kretsen and EÅF. These are then made responsible for the fulfillment of the producer responsibility (El-Kretsen, 2010; EÅF,

2014). As such, collaboration with competitors is used to achieve sufficient volumes and thereby lower the cost of collection and transportation (Herrlin, 2014). It is only through actions taken with competitors that a fulfillment of the producer responsibility is made possible. Ever since the founding of El-Kretsen the business community has been willing to participate which has led to cooperation (Sundin, 2014).

In India, Murthy (2014) states that competition does have an effect on the development of reverse logistics. India is a developing market. As development and competition grows, the market will become more aware of the benefits associated with reverse logistics and companies will be forced to work towards improvement of the quality of their services. The market is open and not regulated to the same extent as in Sweden. This means that companies have a greater freedom in the design of their reverse logistics activities. Murthy states that collaboration with competitors can support this development. Collaboration can help a company reach sufficient return volumes and create an efficient network for collection. This is however, dependent on specific circumstances for each company. Arvind (2014) provides an additional perspective where he states the importance of a functioning market. This is exemplified with how multiple transporters competing for the same service will allow for a lower cost solution for the focal company.

Regulatory Factors

The regulatory framework is by the Swedish respondents identified as a clear prerequisite. A clear regulatory framework creates a secure environment for the actors and allows less room for misunderstanding and cherry picking. According to Sundin (2014) this is important as it enables companies to operate on even terms. Furthermore, as stated by Öhrlund (2014), the regulatory framework prevents anarchy in the market. It is only through regulation that e-products can be guaranteed to be treated in accordance with proper practices. These practices then take relevant environmental considerations into account.

Legislation is also viewed as important by the respondents in India (Arvind, 2014; Murthy, 2014; Nawaz, 2014). According to Murthy (2014), this importance has also been identified by legislators. He mentions tax reform and product subsidies as areas where legislation can have a positive effect on the development of reverse logistics. As in Sweden, it is regulation that provides the framework for how e-waste is handled by organizations. Nawaz (2014) states how legislation forces RBAI to segregate their e-waste into different material fractions. Toxic and hazardous waste, such as components with led content are to be segregated from non-hazardous components.

However, even though the importance of reverse logistics has been recognized by Indian authorities, current legislation is also imposing constraints. Murthy (2014) exemplifies this with how state to state transportation is affected by taxes. India is made up of 28 states. Transport of goods between these states involves taxes. As reverse logistics is growing in terms of transported volumes, this can impose a constraint for companies. A large and regular reverse flow of goods would have to be subsidized from the government due to this taxation if it is to be viewed as a viable option. If such subsidizes are not provided, companies with state to state transports will not realize gains from their reverse logistics activities. Therefore, if transport of goods in the reverse flow exceeds the cost for the forward flow, companies will instead elect to manufacture new products. As such, a higher fraction of products would go to waste where new resources would be needed in production. Murthy specifically mentions the manufacturers of electronic products, transport unions and the government

as actors that must get together to frame rules and guidelines. Essentially this means lobbying with the purpose of creating a more attractive reverse logistics environment as it is affected by laws and guidelines.

Input

Collaboration with actors located upstream in the supply chain is important for the development of efficient processes. However, it can be hard to identify how this collaboration affects reverse logistics development and where it takes place. One example is the collaboration (or lack thereof) between Stena and El-Kretsen. There is a lack of coordination concerning the timing and physical appearance of the products transported from collection sites to recycling facilities. Herrlin (2014) states that Stena would prefer products to be transported in bins, rather than in containers as this facilitate handling at first treatment. Furthermore, Stena exercises little control over the timing of the transports and is forced to accept any amount at any time. This reduces the efficiency of the reverse channel in terms of allocated resources and space at the recycling facility.

Murthy (2014) states that collaboration is necessary in order to achieve efficiency in a company's reverse logistics activities. It is difficult for a company to independently implement and manage its reverse logistics. Therefore, relevant supply chain actors have to get together and find solutions.

Arvind (2014) exemplifies how transport of auto parts bound for the supplier and transport of finished goods to warehouses can be made with the same vehicle. Nawaz (2014) provides the perspective of RBAI. He exemplifies how reuse activities and collaboration upstream in the supply chain can enable cost savings. ESD-bins used for transport of e-products are sent back to the producer for reuse. The bins are made to protect components from electrostatic forces during transport and are expensive. With this procedure, bins can be reused and therefore allows for a reduced production cost. If the bins were not reused the cost would have to be added to the price of the product.

Output

Output is the continuation of the supply chain. This means that buyers have an influence on how companies address reverse logistics. This focus can be placed on customer service aspects, cost of production and price of finished product, product quality or environmental aspects related to production and distribution. As such, consumer pressure acts as a prerequisite.

Öhrlund (2014) exemplifies this with a parallel to the apparel industry in Sweden. In the apparel industry there is no producer responsibility similar to the electronics industry. However, companies such as H&M has taken own initiatives and started collection of old clothes at their stores. These are then bound for recycling and reuse. It is consumer pressure that has stimulated this development. There is a demand to reduce environmental impact from the textiles industry which coincides with the improved corporate image of; in this case, H&M. A similar undertaking for e-products is how El-Giganten and Siba offers consumers the chance to deposit used products at their stores.

In order for companies to enhance their competitiveness it is important to provide for the possibility of easy return and repair of products. Murthy (2014) states that buyers will purchase more products from companies that provide reverse logistics that allow for such possibilities. However, pressure from companies and consumers further down in the supply chain is then limited to this. Buyers do not impose any significant pressure on companies to account for environmental issues that might

arise from production and transport. This means that buyers are likely to place more importance on the actual price of the product and less on influencing companies to reduce their environmental impact.

Arvind (2014) exemplifies the services offered by RBDS. If a defective part is supplied to the aftermarket, a new kit is made and transported to the customer without cost. The defective part is scrapped or brought back to the plant for reuse. This remanufacturing process is carefully tracked due to the differences in quality and cost that are associated with the remanufacturing process. An additional example of how buyer collaboration can function is how RBDS supplies their customer finished goods on specialized pallets. The previously delivered pallets are at time of delivery taken back to the plant to be used again for resupply.

Macro Environment

Apart from the aforementioned prerequisites, the overall macro environment also influences and sets limits on the reverse logistics processes. Existing infrastructure is important. As stated earlier, collection sites were already present before the collection of electronic products was made mandatory in Sweden. As such, all that was needed was to add another fraction. A place to deposit used products is essential for collection. However, it would not be possible to have collection sites on every corner. Such an approach would neither be cost- nor environmentally efficient.

The formal structure of Sweden today, with municipal collection sites, has shown to be very efficient (Herrlin, 2014). Large volumes are allocated from few destinations. From a logistical perspective, this allows for cheap collection with less transport (Öhrlund, 2014). Moreover, Herrlin (2014) states that sufficient treatment capability is necessary. Therefore, recycling facilities must be equipped to handle the products, in terms of volume, but also in terms of safety and environmental standards.

Apart from questions regarding transportation in India, the respondents were not asked questions regarding the state of infrastructure in the country. It was deemed that this was an area that fell outside the expertise of the respondents. As such, for the subsequent analysis, material presented in the theoretical framework is used.

4.4 Reverse Logistics Drivers

This section will state the influence of each reverse logistics driver. As stated in section 2.4 these are economic- and legislative drivers, corporate citizenship and environmental issues. The respondents place different weight on different drivers. This is dependent on the gains that, from their perspective, are possible to realize.

Economic Drivers

Recycling is meant to extract and recover value from used products. Öhrlund (2014) states that the economic driver does constitute a factor for the development of reverse logistics. When more material is recycled, the possibility for cost savings increases. Therefore, this is a fact that attracts all producers. Moreover, the actual recycling is handled by private companies driven by economic factors. This means that the development of processes that serve to extract more material will allow for more profit gains.

In India, the economic driver is by respondents viewed as one of the most important drivers for the development of reverse logistics (Arvind, 2014; Murthy, 2014; Nawaz, 2014). Arvind (2014) states

that the cost benefit associated with a special logistics setup is what drives the development. Murthy (2014) exemplifies areas where reverse logistics can allow for economic gains and that these gains then stimulate companies to devote attention to it. Companies that repair products can realize profits by charging customers for the repair of products and customers can gain by purchasing products with a guarantee of using products for a longer period. Murthy further considers alleviation of some of the taxes related to a reverse flow as important. Nawaz (2014) exemplifies how the economic driver has stimulated RBAI to identify areas for cost savings. One area, as already mentioned, is the case of ESD-bins. Additionally, imported pallets are altered and reused for domestic purposes by local suppliers.

Legislative Drivers

Legislation is by the Swedish respondents identified as the primary driver (Sundin, 2014; Öhrlund, 2014). Legislation creates the necessary framework that companies must follow and force actors to develop their processes. Without legislation the products would not be handled in the same way. Instead it would promote a situation where e-products would be collected and sold on the secondary market to the highest bidder (Öhrlund, 2014). Furthermore, Herrlin (2014) emphasizes the importance of safe and professional transport and treatment. E-waste contains hazardous substances. That proper treatment and necessary measures are taken is ensured by relevant legislation.

A similar identification of legislation as one of the most important drivers is done by the respondents in India (Murthy, 2014; Nawaz, 2014; Arvind, 2014). Similar to the situation in Sweden, it is legislation that provides a framework for how companies chose to address reverse logistics. However, as already stated, taxation can also act as a deterrent for development (Murthy, 2014). Nawaz (2014) states that legislation which aims to reduce environmental impact is viewed as an advantage for RBAI. RBAI characterize themselves as one of the main drivers for the production of environmentally friendly products in their supply chain.

Corporate Citizenship and Environmental Issues

It is difficult to separate corporate citizenship from environmental issues. In a Swedish context, even though companies are not forced to design and produce environmentally friendly products, there is still a will to do this. The reason for this is consumer pressure and corporate image issues (Sundin, 2014). Thus, companies are by themselves not driven to engage in environmental improvements. Instead, consumers and media have the ability to influence both legislation and practices, which in turn stimulate companies and other organizations to develop their reverse logistics processes. Örhlund (2014) gives an example of this. It was recognized that energy efficient light bulbs were deposited in glass recycling receptacles. The issue was raised in the media which subsequently created a consumer pressure and the involvement of the Swedish environmental minister.

However, for the recycling process itself, consumer pressure cannot be imposed to the same extent. The process is complicated and therefore not something that individual persons or even companies generally have knowledge of (Öhrlund, 2014). Nevertheless, this does not mean that consumers and organizations do not care about the recycling. Instead they require the collected material to stay in Sweden and be processed in an environmentally viable way. Exports of e-waste are illegal under the Basel convention. As such, companies are afraid of the fallout stemming from bad media attention (Sundin, 2014).

In India, the respondents state that corporate citizenship and environmental issues are not much of a concern. Murthy (2014) states that companies do not tend to promote the work done in reverse logistics as a way to enhance their corporate image. Similarly, efforts to reduce the environmental impact of production, transport and waste management is not viewed as important. However, as stated earlier, it is difficult to separate environmental issues from economic drivers. An increase in material recovery and reuse of products can be seen as an economic driver. Such an increase will, in turn, reduce the need for new natural resources which has a positive environmental effect. However, this work is not primarily seen as a way to appease consumer pressure and can instead be traced back to profit mechanisms.

Nawaz (2014) states that the methods used to recycle and dispose waste are important. However, he is also reluctant to characterize it as a relevant part of reverse logistics activities for RBAI. Instead, how waste is treated is the result of other factors. It is legislation that forces companies to devote attention to these issues. As such, it is possible to make a separation between voluntary and economically beneficial drivers and mandatory and legislative drivers. Nawaz' statement of the importance of waste disposal would then fall under the latter.

4.5 Improvement Areas

Sweden exhibits an efficient and well-functioning recycling system. However, even this system is in need of development. There are several areas relating to reverse logistics that the respondents identify as possible to improve. These are more collaboration, exploration of different consumer incentives that will increase the willingness to deposit products, more efficient recycling tools, individual producer responsibility and the development of accessibility as improvement areas. These are expanded next.

One area of the collection and recycling system that run the risk of sub-optimization is how containers are used at collection sites, while recycling companies would prefer the use of bins. According to Herrlin (2014) the use of containers allow for highly efficient handling and transport from the site, but in turn further damages the products and make subsequent handling at the recycling facility more difficult. This is because products are placed together, with no consideration for transport damages. Since electronic products contain hazardous materials, this increases the risk for work related injuries, as well as making the recycling procedure unnecessarily difficult.

The Swedish recycling system is based on the initiative of consumers to deposit used products. However, as stated by Öhrlund (2014) some people are not as interested in recycling as others. Therefore, incentives to increase the will of individual persons to deposit electronic products should be explored. This particularly concerns smaller products which are easily kept at home or deposited as MSW (Sundin, 2014).

In terms of the actual recycling of the e-products, there are areas that need improvement. Even though large volumes are recycled, only a fraction of the total material can be extracted. There is still lot of material that goes to landfill (Öhrlund, 2014). The need to extract a higher fraction of the recycled material is evident. This will decrease the need for newly mined rare earth metals or minerals (Sundin, 2014).

As stated in section 2.2.3, criticism has been raised against how producer responsibility is addressed. This criticism is elaborated by Öhrlund (2014). As it stands, producer responsibility is now a collective

responsibility. This means that fulfillment of the producer responsibility for a product that contains more hazardous substances, costs as much as that of a more eco-friendly product. There is no way to identify which products that contain these substances. Neither are there any incentives to create a more environmentally friendly product, apart from quality and environmental pressure from consumers. An economic or legislative incentive does not exist. Thus, in order to solve this, products would have to be traceable from the point of production to the point of recycling.

Society has developed where cities have become larger with fewer people owning a car. According to Öhrlund (2014) this means that the current structure, with collection sites in more remote areas is not practical. Therefore, other systems that can handle e-waste in the city center must be developed. Several systems that attempt to rectify a part of this issue have been tested. One such system, *the Collector*, was introduced by Renova together with El-Kretsen. It is used to deposit items, such as light bulbs and cellphones and other small electronic products. However, Herrlin (2014) states that this project has proven to be very expensive. Herrlin instead describes another project in the form of an environmental station developed by Stena. It will allow for similar depositing possibilities as the Collector. It is currently being evaluated in a pilot project together with Stena Fastigheter. Stena hopes that the environmental station will allow condominiums and other real estate organizations to collect e-waste from their residents at a lower cost compared to the Collector.

The amended WEEE-directive, which will come into force during 2014, will force all stores over the size of 400 m^2 to collect e-products free of charge. This means an increase in the accessibility for consumers and possibly an increase in the collection of smaller electronic items. Consumers would no longer be restricted to municipal collection sites, the Collector or similar projects or voluntary initiatives, such as those provided by Siba and El-Giganten. However, the public must also be educated that this option exist (Herrlin, 2014).

4.6 Summary of Empirical Findings

The empirical findings highlight the differences between the two countries. Sweden is a well-developed country with a long tradition of waste management. This has facilitated the handling of e-waste. India is now struggling to come to terms with a growing problem. It has been shown that the issues associated with e-waste are only recently beginning to see an interest from authorities and actors in the private sector.

The respondents have described the Swedish system for collection and recycling. It is said to be efficient and well-functioning. Collection is separated into two primary flows; municipal collection and B2B collection. Municipal collection accounts for 98 percent of the collected e-waste. Having only one organization responsible for collection and transport enables high efficiency and make it easy for consumers to deposit their products at designated collection sites. A similar generic description of the Indian situation is not possible to provide. Material recovery of e-products to a large extent involves the informal sector. Thus, reverse logistics is still more focused on profit mechanisms and less on issues associated with the environmental impact of the products.

It has further been shown that producers in Sweden collaborate in trade associations. This is done to enable fulfillment of the producer responsibility. Setting up individual collection systems is described as nearly impossible. Similar collaboration is not done in India. The market is not as regulated. This means a greater freedom for companies in the design of their reverse logistics activities. Focus is less on collaboration and more on the services offered by competitors. However, collaboration between

competitors as a means to achieve greater volumes is still mentioned as a possible way to improve the efficiency of the reverse flow.

The existence of a regulatory framework is by the Swedish respondents identified as a clear prerequisite. It creates a fair market, free from cherry picking and ensures the proper treatment of waste. The importance of legislation has only recently been recognized in India. Moreover, legislation is also described as having an adverse effect on reverse logistics development. Taxation for state to state transportation can mean it is cheaper to manufacture new products, rather than to engage in repair and refurbishment activities.

Collaboration in the supply chain has been shown to have an effect on the efficiency of the reverse flow and the possibility to achieve cost reductions. It is difficult for a company to independently implement and manage its reverse logistics activities. The respondents exemplify this with the timing of transports and the physical appearance of the products bound for recycling as well as the reuse of load-carriers from suppliers.

Consumer pressure has been shown as a tool for development. The respondents in Sweden state that consumer pressure influences the strategies and activities of companies, such as voluntary collection of used products. In India it has been shown that this pressure takes a different form. Focus is placed more on price and the services offered by a company. Less focus is placed on influencing companies to reduce the environmental impact of their products and services.

The Swedish situation with already existing collection sites has been shown as a facilitator for the collection of e-waste. Only little modification was necessary to allow for collection of an additional fraction. Furthermore, sufficient recycling facilities have been shown as imperative.

The economic driver is one of the key drivers for the development of reverse logistics. In Sweden, the respondents talk about material recovery from recycling as a way to reduce costs and increase earnings. In India, economic factors are similarly, if not even more, described as important.

Both respondents in Sweden and in India highlight the importance of legislation as a driver for reverse logistics development. It is legislation that forces companies to develop their processes and ensures proper treatment. However, legislation can also act as a deterrent, such as how it restricts state to state transportation in India.

The importance of corporate citizenship and environmental issues are two areas where differences between the two countries are seen. The Swedish respondents' state that Swedish companies are aware of the importance of corporate image issues and that they therefore work towards reduced environmental impact of their products and services. In India, such pressure is not seen to the same extent.

5. Analysis

This chapter contains the analysis. The empirical findings for Sweden and India are contrasted and compared to each other together with theories presented in the theoretical framework. The chapter starts with a short review over the current state of reverse logistics in Sweden and India. This is followed by sections that connect back to the main research question and sub-question respectively. Conclusions that will answer the research questions are then given in the subsequent chapter.

The respondents that have answered our questions are from various sectors and have provided data that is applicable to their field. This is important to bear in mind for the analysis. Conclusions are in certain cases only relevant for that specific setting. However, since this thesis is a study on the prerequisites of reverse logistics development and the drivers associated with this development, conclusions of a more generalizable nature are thus also given.

5.1 State of Reverse Logistics in Sweden and India

As stated in section 2.1, the definition of reverse logistics has undergone several changes in recent years. Since its conception in the 1980's, it has evolved into a concept that includes reduced environmental impact, together with the realization of economic gains. In developed markets it is now a viewed as a necessary activity, in need of proper attention and resources (Hazen, Hall & Hanna, 2014:245).

That there exist differences in the motivations for reverse logistics between developed and saturated markets on one hand; and developing and growing markets on the other hand, is stated not only in theory, but is also supported by empirical findings. Section 2.5.1, describes waste handling in Sweden. Infrastructure (Nnorom & Osibanjo, 2008); a tradition of recycling (Cairncross, 1992); municipal collection (Lindqvist, 2013) and legislation have facilitated Sweden's position as one of the leaders in terms of efficiency and environmental consideration.

The Swedish respondents confirm this description. Tradition, awareness, consumer pressure, legislation and infrastructure are words used to describe how the Swedish system has developed. As can be seen, aside from legislation and infrastructure, the words chosen to describe Sweden's development and situation are to a large extent related to values, norms and conventions. As such, to instill these values in another context could be difficult.

Section 2.5.2 describes the Indian situation. That change will come through development (Srivastava & Srivastava, 2006); a focus on price and costs (Sinha-Khetriwal, Kraeuchi & Schwaninger, 2005); issues associated with the informal sector (Manomaivibool, Lindhqvist & Tojo, 2007); lack of enforcement (Sinha-Khetriwal, Kraeuchi & Schwaninger, 2005) and insufficient infrastructure (Manomaivibool, Lindhqvist & Tojo, 2007) are identified as the main characteristics of reverse logistics in India.

This description is, to some extent, also supported by interview material. It is stated that as society and markets develop in India, it will bring with it an awareness of the benefits associated with reverse logistics. This awareness will force companies to devote more attention to the development of competitive services and product offerings. As it stands, companies and buyers place more weight on the actual price the product, rather than on a reduction of the environmental impact associated

with production and after-life treatment. Moreover, legislation in the form of taxation is stated as restricting development.

What the previous section has done is underlining some of the differences between the two countries. As such, it has also highlighted the purpose of this thesis. This thesis is a study on external prerequisites and an exploration of the motives behind reverse logistics development. Therefore, there is a need to place each country in its respective context. What is described as true and beneficial for reverse logistics in Sweden might not be a viable solution in India, and vice versa. As such, the thesis intends to answer the research question that is stated below:

How do external prerequisites affect the development of reverse logistics for e-products?

This is coupled with the sub-question:

How do drivers stimulate the development of reverse logistics for e-products?

Discussions around the main research question and sub-question are provided in section 5.2 and 5.3 respectively.

5.2 Reverse Logistics in Relation to External Factors

In line with the definition of external factors provided in section 2.3, a discussion around how these affect reverse logistics development, based on interview material and theory, is given.

Competitive Factors

As stated in section 2.3.1, competitive factors are separated into two factors. That is actions taken *with* competitors and actions taken *by* competitors. Both these factors are addressed by the respondents and discussed below.

Cairncross (1992:44) and Ravi, Shankar and Tiwari (2005:337) state that a company that isolates themselves to their own product assortment might not find it worthwhile to engage in reverse logistics. Collaboration with competitors can allow for a more efficient reverse logistics system that allows for allocation of volumes from more dispersed geographical areas.

This point is further supported by empirical findings. The material retrieved from the Swedish respondents' describes how actions taken *with* competitors can mean an increase in efficiency and the possibility to achieve what would otherwise not be possible. Through membership in a trade association a producer is able to fulfill its producer responsibility. This collaboration allows for a nationwide collection network for e-waste. For instance, even though Siba does not have outlets in the northern parts of Sweden, its membership in a trade association ensures that it is still possible to fulfill the requirements set out in legislation.

The respondents in India provide a different perspective. Actions taken *by* a competitor, which serve to augment its reverse logistics activities, will have an effect on the focal company as well. This is because a company needs to stay competitive. If a competitor, through development of its reverse logistics, is able to offer better terms, cheaper products and services or more consistent quality, other companies will be forced to develop their reverse logistics as well.

The market in India is not as regulated as the market in Sweden. This means that companies enjoy a greater freedom in the design of their reverse logistics processes. Companies can tailor their reverse

logistics processes to the individual needs of the company. This can allow for cost-savings. However, at the same time it is legislation that often applies the necessary pressure on companies to develop their processes, and it is legislation that forces a company to account for environmental impact. How regulatory factors affect reverse logistics is discussed in the next section.

As can be deduced from the discussion, competitive factors are important for the development of reverse logistics. This is true for both factors, i.e. actions taken *with* and actions taken *by* competitors. In order to achieve efficiency in the processes, it is often necessary to strive for collaboration with competitors. The discussion has also highlighted that in order to stay attractive in a competitive market place; a company is forced to take the action of competitors into account when designing their own logistics processes.

Regulatory factors

Carter and Ellram (1998:95) describe legislation as one of the most important factors for the development of reverse logistics. It is legislation that forces companies towards a harmonized system. This is also confirmed by interview material.

The Swedish respondents state that it is legislation that creates a secure environment with less room for misunderstanding. It is legislation that ensures that not only profit acts as the driver for development and it is legislation that ensures that products are treated in line with environmental consideration. Sweden's timely implementation of the WEEE-directive has also facilitated this situation.

The situation in India is described differently. While one respondent state that legislators has now recognized the importance of a regulatory framework, it is also stated that it is legislation that often restricts reverse logistics development. As stated in section 2.5.2, India has implemented e-waste legislation in line with EPR practices. Apart from the stipulation that producers' should account for the cost associated with after-life treatment, the rules are also meant to stimulate training and awareness, provide incentives for green products, formalize recycling and ensure proper segregation of e-waste and MSW (MoEF, 2011:40). This is exemplified with how the rules now forces RBAI to segregate hazardous material from non-hazardous waste.

However, interview material also shows that legislation, and primarily taxes, have a hampering effect and that more could be done to incentivize development. Ho et al. (2012:33) comes to the same conclusion in section 2.5.2. A large reverse flow of products, which goes state to state in India, runs the risk of being more expensive than newly manufactured products. This means a greater need for new material and a greater strain on limited resources. Therefore, subsidizes are called for to alleviate this issue.

As can be realized from the discussion, legislation is one of the most important areas for the development of reverse logistics. Without encompassing legislation, it is difficult to develop the functions found in the Swedish system. Companies have a great ability to adapt to harsher restrictions. What are asked for are clarity, clearness and fair market conditions. However, the situation in India shows that regulation must be formulated in accordance with the prevailing situation. This means that incentives in the form of subsidies should be considered to stimulate the development of reverse logistics processes.

Input

As stated in section 2.3.3, collaboration with actors located upstream from the focal firm is a vital factor for the development of efficient reverse logistics. Ravi and Shankar (2005:1017) state that the absence of cooperation is serious deterrent when reverse logistics will be implemented. However, as also stated, collaboration between actors is not unproblematic. Difficulty in reaching mutually beneficial agreements and the often greater power of one actor can limit the areas where agreements can be made and increase the risk for sub-optimizations.

This difficulty is exemplified in the interview material. It is stated that solutions that enable easy handling at first treatment and transport of e-waste in bins is preferred by recyclers. The owner of the logistical operation wants to rationalize the transports and, therefore, opt for containers. Moreover, the timing of delivery is also an area that could benefit from a more close collaboration. Recycling companies have only limited ability to affect when and how material is delivered to their facilities. However, even with the difficulties stated here, the system is still described as efficient by the respondents. This then shows that collaboration between the actors is done to a satisfactory degree. This is further supported by how one respondent state that the involvement of the business community, from the very beginning, has led to cooperation.

The importance of collaboration, as stated by Ravi and Shankar, is shared by the respondents in India. As stated by one respondent, it is difficult for a company to independently implement and manage its reverse logistics activities. Theory confirms this description. In section 2.2.5 Fleischmann et al. (1997) state the importance of proper identification of the actors and the functions involved in reverse logistics. The activities range from collection, testing, sorting, transportation and processing. The scope of these activities means that collaboration is a necessary ingredient if efficiency is to be achieved. The example of RBAI, with the reuse of their ESD-bins, shows one situation where collaboration allows for a solution that is beneficial for both the focal firm and its supplier.

As can be deduced from the discussion, empirical findings confirm the presented theory. The scope and the many implications associated with reverse logistics make it necessary for the focal company to identify which supply chain actors and which functions that deserve a more tight-knit collaboration. This collaboration should then be void of sub-optimizations.

Output

In section 2.3.4, output is described as the continuation of the supply chain. This is material that is bound for wholesalers, retailers, manufacturers and service providers etc. (Ho et al., 2012:33). Moreover, it is the end consumer and the pressure that these apply on companies.

What consumers' place weight on constitutes a big difference between Sweden and India. This is related to standard of living and other socio-economic factors. In India's current state, with a focus on cost and low price, reduced environmental impact is considered a luxury and not a necessity. In Section 2.5.2, two studies state that the Indian consumer is more sensitive to price and less to quality and environmental aspects of products (Srivastava & Srivastava, 2006:525; Sinha-Khetriwal, Kraeuchi & Schwaninger, 2005:498). Interview material confirms these statements. The Swedish situation is discussed first.

In Sweden, one respondent makes a parallel to the apparel industry and how voluntary efforts that serve to reduce the environmental impact of the textiles industry are seen as important. This

example serves to show that even in the absence of legislation there is still a will to be seen as a responsible actor. This is further evident in how both Siba and El-Giganten allow consumers to deposit electronic products at their stores. This is also done in the absence of legislation. As such, consumer pressure forces companies to explore new initiatives in their reverse logistics activities.

In India, as can be deduced from theory and empirical findings, the focus is elsewhere. One respondent state that the competitiveness of a company; in terms of price, ease of return and repairs is more important than the aforementioned issues. RBDS offers replacement of defective parts where associated costs fall back on the producer. Prospective buyers do not impose the same pressure on companies to reduce the environmental impact of their products and offerings as they do in Sweden. Focus is instead on price and cost aspects of a product and service. However, as stated in section 2.5.2, by Srivastava and Srivastava (2006:525) this focus is bound to change. Growth in consumer awareness will create a situation where attention will shift more to reduced environmental impact.

The discussion illustrates the difference between the two countries in terms of how consumer pressure affects the offered services. Values, norms, conventions and economic factors contribute greatly to which factor that consumers deem as most important. The voluntary efforts by Swedish retailers, in both the apparel industry and the electronics industry, serve to show this influence. In India, it is important to realize that reduced environmental impact is not considered a priority in competition with other more pressing matters. Therefore, market growth, reduced cost and competitive services is viewed as more important. However, as mentioned, this is bound to change as the country develops.

Macro Environment

In section 2.3.5, the macro environment is described as influencing the development of reverse logistics (Ravi & Shankar, 2005:1017). To a certain extent, this is the same forces that have been discussed in the previous section about Output, i.e. standard of living and with it consumer pressure. However, included here is also a discussion around infrastructure. These factors contribute to the will and success rate of companies when they develop their reverse logistics processes.

According to Lifset, Atasu and Tojo (2013:162) one of the primary benefits associated with EPR legislation is how it drives infrastructure development for recycling. Section 2.5.1 states that infrastructure for collection and subsequent treatment of e-waste in Sweden is well developed (Nnorom & Osibanjo, 2008:849). The respondents also state that Sweden's efficiency and position has been facilitated by the presence of already existing infrastructure. The municipal collection sites allow for efficient collection, where the addition of an additional fraction was all that was needed for the collection of e-products. Collection at a few designated places allows for cheap collection and less transport to treatment facilities.

India is lacking necessary infrastructure for treatment of e-waste. As stated in section 2.5.2 this issue has been recognized by the government (Bhowmick, 2011). The implementation of the new regulation, which has been formulated in line with EPR practices (MoEF, 2011:29), will act as a driver for the development of adequate infrastructure. Companies will be able to effect pressure on the government for the creation of this. As also stated, more and more companies now realize the potential found in the recycling industry (EIA, 2014). Therefore, it is clear that this is something that will change in the future. Whenever end-of-life electronic products are discussed in an Indian

context, it is necessary to include the informal sector into the discussion. This is further discussed under Legislative Drivers. However, more in-depth discussions around these issues; how to include the informal sector and/or how to move volumes away from it are subjects for another study.

5.3 Reverse Logistics Drivers

In line with the definition of reverse logistics drivers provided in section 2.4, a discussion around how these affect reverse logistics development, based on interview material and theory, is given.

Economic Drivers

In section 2.4.1 Poist (2000:54) identifies economic factors as the main driver for reverse logistics. Others would argue that it is legislation that acts as the main driver (Nnorom & Osibanjo, 2008:844); however, as stated in section 2.5.2 this is often dependent on the country of preference. For instance, reverse logistics in North America is mainly driven by profit mechanisms (Srivastava & Srivastava, 2006:525). The economic driver supports the aim of a typical business, i.e. a short or long-term profit realization.

The importance of the economic driver is recognized by the Swedish respondents. Recycling is meant to extract and recover value from used products. As such, it is said that if a greater share of products are recovered, cost savings can increase. Thus, producers are inclined to stimulate this development as it allows for cheaper production of new products. It is private companies that are responsible for the actual recycling. As these companies make most of its money through sale of material to the secondary market, the employed processes are developed so as to allow for a more far-reaching and efficient recycling.

Respondents in India provide a similar sentiment. The economic driver is identified as one of the most important drivers for the development of reverse logistics. One respondent state that the cost benefit found in a special logistics setup is what drives development. As such, it is only through the realization of cost savings that this setup is attractive for implementation. This is further supported by another respondent. As stated, state to state transportation restricts the reverse flow of products in India. Measures to alleviate this issue should be considered.

It is clear that the economic driver can only stimulate development to a certain extent. It is not able to provide a holistic solution. This is supported by the statements above. Profit realization is important for a company. As such, there is a need to couple economic driving forces with legislation. This will force development in areas that are not similarly attractive for companies to devote attention to. The importance of the legislative driver is discussed in the next section.

Legislative Drivers

As stated in section 2.4.2, legislation concerns laws that impose take-back obligations for companies after the end-of-life of a certain product (Ravi, Shankar & Tiwari, 2005:331). One example is how the WEEE-directive regulates the handling and forces producers to internalize cost associated with after-life management (Directive, 2012). Another is how the directive sets to reduce the amount of e-waste that is generated.

Legislation is one of the key drivers behind reverse logistics development. The Swedish respondents state that it is legislation that has facilitated the present situation. Since legislation in Sweden was implemented in line with a growing environmental awareness, it has worked as a supportive tool to

develop and maintain the existing tradition of the country. The early implementation of the WEEE-directive is an example of this. The WEEE-directive means a proper and secure treatment without letting profit act as the sole developing driver of reverse logistics.

As stated by Lindqvist (2013:146) in section 2.5.1, Sweden has followed the pattern of other countries for the outsourcing of services to private actors. The reason for the high degree of efficiency in Sweden's waste management is the involvement of municipalities, producers and end-users. These are forced by law to fulfill certain waste handling requirements. The absence of legislation would promote a situation similar to the Indian secondary market. As stated by respondents, e-waste requires professional transport and treatment in order to assure both human and environmental safety.

Although legislation is also viewed as the guiding framework for companies in India, the situation between the countries differs. In section 2.5.2 Manomaivibool, Lindhqvist and Tojo (2007:11) identify the informal sector as both the root and potential solution to issues related to e-waste management. Even though the informal sector is well developed and functional, safe and secure treatment is not assured. However, even so and similar to the situation in Sweden, it is the legislation that provides a framework for how companies chose to address reverse logistics. Raghupathy et al. (n.d.) describes how legislation can provide a framework for a sound e-waste management system. The objective is to formulate WEEE-legislation in accordance with EPR practices and to register all formal and informal actors involved in waste handling processes. This will be coupled with education of the hazards involved in e-waste handling and the development of existing structure.

It can clearly be seen that legislation acts as an important driver in both countries. It is there to provide a legal framework which increases the efficiency of e-waste handling and decreases human and environmental injuries. However, Indian legislation now encounters several issues which are not found in Sweden. This primarily concerns a missing tradition and a late implementation of proper legislation. Even though legislation is now set and investments for recycling plants are provided, the ability to enforce the informal sector to follow the rules should be viewed as a long term investment. Additionally, legislation that concerns the large amount of e-waste imported into India needs to be considered in order to limit the present volumes in the informal sector. As such, loopholes such as those mentioned in section 2.2.3 need to be closed.

Corporate Citizenship and Environmental Issues

As stated in section 2.4.3, corporate citizenship is how the principles and values of a company can induce a company to devote attention to causes that are beneficial for the society (Ravi, Shankar & Tiwari, 2005:331). For the sake of this argument, this cause is reverse logistics. As such, reverse logistics can enhance the corporate image of a company. How Nike uses old shoes for basketball courts is one example (Rogers & Tibben-Lembke, 2001:23). Similar examples are given by the Swedish respondents, i.e. the voluntary collection initiatives of H&M, Siba and El-Giganten.

As stated in section 2.4.4, the last driver for reverse logistics development is environmental issues (Ravi, Shankar & Tiwari, 2005:332). Mitigation of environmental effects has seen a growing interest. This interest encourages companies and organizations to explore new and efficient options for take-back and waste disposal (Murphy et al., 1995 cited in Ravi, Shankar & Tiwari, 2005:331). Corporate citizenship and environmental issues are to a certain extent intertwined.

The companies previously mentioned and the examples given by the Swedish respondents can be attributed to both corporate citizenship and environmental issues. There is a will of these companies to enhance their public image while at the same time reduce the environmental impact of their products. This trend is further accentuated by how traditional- and social media have the power to shape the public image of a company.

In India, as elaborated by the respondents, these factors do not drive development in a similar fashion. One respondent state that the activities associated with reverse logistics activities is not used as a promotional tool for greening of the company brand or reduced environmental impact. One respondent does not even view waste management as a part of reverse logistics. Profit mechanisms act as the primary driver and with this it is still possible to reduce the environmental impact. This is done through material recovery and reuse of products. This will put less strain on limited resources. As such, it can be argued that environmental issues and economic factors are also connected.

What is clear from this discussion is that that corporate citizenship plays a larger role in Sweden compared to India. Companies are wary of bad press and many times instead move to implement measures above and beyond present legislation. The combined drivers of corporate citizenship and environmental issues are then relevant to take into account when describing the forces that affect the development of reverse logistics.

5.4 Summary of Analysis

The analysis has shown that both similarities and differences exist for external factors and drivers in the two countries. Next follows a summary of these characteristics.

Collaboration with competitors has been identified as a clear prerequisite for reverse logistics. Actions that are impossible for an individual company can be done to great efficiency by pooling efforts with competitors. Furthermore, in order to stay competitive, it is important for a company to look at the services offered by competitors and make a decision if similar services should be offered.

A clear regulatory framework has been shown to be the most important prerequisite for reverse logistics. It creates a secure operating environment for companies. However, it has also been shown that the regulatory framework must be fashioned in such a way so it does not restrict what are otherwise beneficial activities.

Collaboration with actors in the supply chain has been shown as important. It is necessary to identify the actors and functions needed for reverse logistics. Collaboration with these actors should then be done with care so to avoid sub-optimizations.

The pressure effected from consumers has been shown as one of the major differences between Sweden and India. This difference is possible to derive from values, norms, conventions and economic factors. In Sweden, more attention is given to measures that reduce environmental impact. In India, cost reductions and market growth are still the major focus areas.

The importance of infrastructure for collection and treatment has been shown as a prerequisite for efficient and safe electronic waste management. Municipal collection in Sweden has facilitated collection and transport while India is lacking adequate infrastructure.

Economic drivers have been shown as one of two main drivers for reverse logistics development. This is even truer for countries with inadequate or newly implemented legislation, such as India. However, also in Sweden private companies are driven by profit realization.

The other main driver is legislation. Legislation ensures that areas that are not attractive from an economical viewpoint are treated seriously. As such, it forces companies to develop their processes so as to minimize the inconvenience caused by legislation, thus driving development.

Corporate citizenship and environmental issues has been shown to play a larger role in Sweden compared to India. Companies in Sweden are wary of bad press and move to implement measures beyond present legislation. Corporate citizenship and environmental issues have further been shown to be intertwined and difficult to separate.

6. Conclusion

This chapter will provide an answer to the research questions through a summary of the conclusions that have been possible to draw. This is coupled with areas that would benefit from future research. These suggestions act complimentary to this study or are otherwise relevant for reverse logistics.

The research aims to answer the main question:

How do external prerequisites affect the development of reverse logistics for e-products?

The answer to the research question above is complemented through the answer of the sub-question:

How do drivers stimulate the development of reverse logistics for e-products?

In the theoretical framework the external prerequisites and related drivers are defined through relevant scientific articles. The external prerequisites and drivers are then used to formulate questions for the Swedish and Indian respondents participating in this research. The empirical findings are analyzed and provide the basis for the analysis. As Sweden and India are two distinct countries with separate characteristics, the prerequisites have been analyzed with this in mind. The two compared markets differ in size and population. This, together with values, norms and conventions plays a big part in the differences of reverse logistics development and the possibility to implement a recycling tradition in India.

It has been shown that collaboration with competitors can act as a mean for the development of reverse logistics. Companies can cooperate to reach sufficient volumes or cover dispersed geographical areas. It has further been shown that in order to stay competitive it is important for a company to look at the services offered by competitors and make a decision if similar services should be offered.

It has been shown that a regulatory framework is the most important prerequisite for the development of reverse logistics. Regulation creates a safe environment through control over the processes which are used to address reverse logistics issues. Moreover, legislation also ensures that actions that are not attractive from an economical viewpoint are addressed seriously. This fact has led to efficient systems. It has also been shown that the regulatory framework must be fashioned in such a way so it does not restrict what are otherwise beneficial activities.

It has been shown that collaboration with actors upstream in the supply chain is important since it allows for identification of the necessary actors and functions for reverse logistics. This collaboration should be mutually beneficial and free of sub-optimizations.

It has been shown that pressure effected from consumers is one of the major differences between Sweden and India. In Sweden, consumer pressure influences companies to reduce environmental impact. In India, consumer pressure is still focused on cost reductions and price of products.

It has been shown that adequate infrastructure acts as a mean for efficient reverse logistics. Sweden has a well-developed infrastructure for collection and treatment of e-products. However, India’s

current state of infrastructure restricts collection and treatment of e-products outside of the informal sector.

It has been shown that economic and legislative drivers are the most important drivers for reverse logistics development. The economic driver is given more weight in India compared to Sweden. Lack of legislation and consumer pressure creates a situation where possible cost reductions are what stimulate development. The legislative driver ensures that areas that are not attractive from an economical viewpoint are treated seriously. This drives development, motivating companies to minimize the inconvenience and costs caused by legislation.

It has been shown that corporate citizenship and environmental issues play a larger role in Sweden compared to India. Sweden has had a habit of recycling even before legislation was implemented. This fact has created a situation where companies have to account for their environmental impact. Therefore, companies move to implement measures beyond present legislation. Corporate citizenship and environmental issues have further been shown to be intertwined and difficult to separate.

6.1 Suggestions for Future Research

There are several areas related to this study that would benefit from additional study. These areas have in part been identified by the Swedish respondents. This is coupled with areas the authors have come across during the research process.

The respondents state that the Swedish recycling system for e-waste is satisfactory. However, there are areas that could be improved and there are areas that must change in order for the system to retain its functions in a changing environment. Therefore, different consumer incentives that serve to stimulate collection can be explored further; identification of issues and subsequent recommendations that serve to move away from the collective responsibility of EPR to more individual producer responsibility would be beneficial; and finally, for a generation where less and less people own a car, improving accessibility to collection sites or other means for collection can be explored.

This has been a study on external factors. This means non-company specific factors related to reverse logistics. As such, a study on internal factors would be complementary to this research. This means that a study on the specific characteristics of companies and how this affect reverse logistics would be interesting. Relevant parameters for such a study could be number of people employed, age of company, turnover, background of management, profile, product assortment etc. Such a study could identify which typical businesses that have difficulties to implement reverse logistics and give subsequent recommendations to alleviate these issues.

Product recovery in India involves the informal sector. As stated, around 95 percent of the generated e-waste is funneled into the informal sector (Bhowmick, 2011; Raghupathy et al., n.d.). As such, a study on how to include or move away from the informal sector would be interesting.

This study has been a comparison of reverse logistics between two countries with very different environments. A study of more similarly developed countries with mature markets would complement this research. Examples of countries for this study could be the Nordic countries,

Germany, Switzerland and/or USA. Given that these countries function on similar terms, it would allow for narrower research into specific areas.

The logistical operation from collection sites is described as efficient. Full-truck-loads allow for high capacity utilization. However, the potential sub-optimization that this entails has not been addressed. Personal transport to and from the collection site is not part of the discussion around efficiency and environmental impact. Therefore, a study on the number and placement of collection points is needed.

To conclude the suggestions for future research, this study has been conducted through a qualitative research paradigm. A more quantitative study would act complimentary to this. This would allow for a statistical comparison and conclude the relevance of each external factor and driver.

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Figure 2.1 – Reverse logistics network
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Figure 2.2 – External factors affecting the development of reverse logistics
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7.2 List of Tables

Table 2.1 – Product categories
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8. Appendix

8.1 Appendix 1 – Categories Covered by the WEEE-Directive

1. LARGE HOUSEHOLD APPLIANCES

Large cooling appliances

Refrigerators

Freezers

Other large appliances used for refrigeration, conservation and storage of food

Washing machines

Clothes dryers

Dish washing machines

Cookers

Electric stoves

Electric hot plates

Microwaves

Other large appliances used for cooking and other processing of food

Electric heating appliances

Electric radiators

Other large appliances for heating rooms, beds, seating furniture

Electric fans

Air conditioner appliances

Other fanning, exhaust ventilation and conditioning equipment

2. SMALL HOUSEHOLD APPLIANCES

Vacuum cleaners

Carpet sweepers

Other appliances for cleaning

Appliances used for sewing, knitting, weaving and other processing for textiles

Irons and other appliances for ironing, mangling and other care of clothing

Toasters

Fryers

Grinders, coffee machines and equipment for opening or sealing containers or packages

Electric knives

Appliance for hair cutting, hair drying, tooth brushing, shaving, massage and other body care appliances

Clocks, watches and equipment for the purpose of measuring, indicating or registering time

Scales

3. IT AND TELECOMMUNICATIONS EQUIPMENT

Centralized data processing:

Mainframes

Minicomputers

Printer units

Personal computing:

Personal computers (CPU, mouse, screen and keyboard included)

Laptop computers (CPU, mouse, screen and keyboard included)

Notebook computers

Notepad computers

Printers

Copying equipment

Electrical and electronic typewriters

Pocket and desk calculators

and other products and equipment for the collection, storage, processing, presentation or communication of information by electric means

User terminals and systems

Facsimile machine (fax)

Telex

Telephones

Pay telephones

Cordless telephones

Cellular telephones

Answering systems

and other products or equipment of transmitting sound, images or other information by telecommunications

4. CONSUMER EQUIPMENT AND PHOTOVOLTAIC PANELS

Radio sets

Television sets

Video cameras

Video recorders

Hi-fi recorders

Audio amplifiers

Musical instruments

and other products or equipment for the purpose of recording or reproducing sound or images, including signals or other technologies for the distribution of sound and image by telecommunications

Photovoltaic panels

5. LIGHTING EQUIPMENT

Luminaires for fluorescent lamps with the exception of luminaires in households

Straight fluorescent lamps

Compact fluorescent lamps

High intensity discharge lamps, including pressure sodium lamps and metal halide lamps

Low pressure sodium lamps

Other lighting or equipment for the purpose of spreading or controlling light with the exception of filament bulbs

6. ELECTRICAL AND ELECTRONIC TOOLS (WITH THE EXCEPTION OF LARGE-SCALE STATIONARY INDUSTRIAL TOOLS)

Drills

Saws

Sewing machines

Equipment for turning, milling, sanding, grinding, sawing, cutting, shearing, drilling, making holes, punching, folding, bending or similar processing of wood, metal and other materials

Tools for riveting, nailing or screwing or removing rivets, nails, screws or similar uses

Tools for welding, soldering or similar use

Equipment for spraying, spreading, dispersing or other treatment of liquid or gaseous substances by other means

Tools for mowing or other gardening activities

7. TOYS, LEISURE AND SPORTS EQUIPMENT

Electric trains or car racing sets

Hand-held video game consoles

Video games

Computers for biking, driving, running, rowing, etc.

Sports equipment with electric or electronic components

Coin slot machines

8. MEDICAL DEVICES (WITH THE EXCEPTION OF ALL IMPLANTED AND INFECTED PRODUCTS)

Radio therapy equipment

Cardiology equipment

Dialysis equipment

Pulmonary ventilators

Nuclear medicine equipment

Laboratory equipment for in vitro diagnosis

Analyzers

Freezers

Fertilization tests

Other appliances for detecting, preventing, monitoring, treating, alleviating illness, injury or disability

9. MONITORING AND CONTROL INSTRUMENTS

Smoke detector

Heating regulators

Thermostats

Measuring, weighing or adjusting appliances for household or as laboratory equipment

Other monitoring and control instruments used in industrial installations (e.g. in control panels)

10. AUTOMATIC DISPENSERS

Automatic dispensers for hot drinks

Automatic dispensers for hot or cold bottles or cans

Automatic dispensers for solid products

Automatic dispensers for money

All appliances which deliver automatically all kinds of products

(Directive, 2012:54-57)

8.2 Appendix 2 – Interview Structure

Questions for El-Kretsen and EÅF (in Swedish)

1. Sverige är på många sätt ett föregångsland vad gäller hanteringen av uttjänta elektriska och elektroniska produkter (e-produkter). Varför är det så?

2. Beskriv steg för steg hur insamlingen av uttjänta e-produkter går till. Vilka aktörer är inblandade?

3. Vad är anledningen till att hantering av uttjänta e-produkter sker genom en samordnande organisation?

4. Från ett producentperspektiv, vilka fördelar finns det med att en extern aktör samordnar hanteringen av uttjänta e-produkter? D.v.s., varför har företag valt att ansluta sig och inte valt mer individuella lösningar?

5. Hur involverade i vidareutveckling/effektivisering av er verksamhet är de företag som är anslutna till El-Kretsen/EÅF? Skiljer det sig beroende på företagsstorlek, företagsprofil, om företaget är i direktkontakt med slutkonsumenter eller annat?

6. Vilka områden kan förbättras vad gäller hanteringen av uttjänta e-produkter?

7. Vad har drivit/driver utvecklingen för hur uttjänta e-produkter hanteras i Sverige? Är det tvingande lagstiftning, att företag ser en möjlighet för kostnadsbesparingar, en del i ett företags varumärkesbyggande, miljöhänsyn eller annat?

8. Vilka grundförutsättningar är nödvändiga för utvecklandet av en effektiv returlogistik för uttjänta e-produkter? D.v.s., hur viktigt är tillgänglig infrastruktur (insamlingsstationer, återvinningsanläggningar etc.), regelverk, engagemang från företag, eventuell påtryckning från konsumenter eller annat?

Questions for Stena Technoworld (in Swedish)

1. Beskriv steg för steg hur insamling och återvinning till råvara av uttjänta elektroniska produkter (e-produkter) går till. Vilka aktörer är inblandade? Är det ett effektivt och välfungerande system?

2. Sverige är på många sätt ett föregångsland vad gäller hanteringen av uttjänta elektriska och elektroniska produkter. Varför är det så? Delvis från ett företagsperspektiv, vad har drivit utvecklingen i Sverige? Är det tvingande lagstiftning, att producenter ser en möjlighet för kostnadsbesparingar, en del i ett företags varumärkesbyggande, miljöhänsyn eller annat?

3. Varför anlitar företag era tjänster? Är det främst för att uppfylla producentansvar, för att minska kostnader och möjliggöra ökad avkastning eller miljöhänsyn?

4. Vilka grundförutsättningar är nödvändiga för utvecklandet av en effektiv returlogistik för uttjänta e-produkter? D.v.s., hur viktigt är tillgänglig infrastruktur (insamlingsstationer, återvinningsanläggningar etc.), regelverk, engagemang från företag, samarbete mellan företag, vad konsumenter efterfrågar eller annat?

5. Är de företag som anlitar era tjänster (såsom individuella producenter, återförsäljare, branschföreningar) involverade i vidareutveckling/effektivisering av hanteringen av uttjänta e-produkter? Skiljer sig förertagsengagemang beroende på storlek, profil, om företaget är i

direktkontakt med slutkonsumenter eller annat? Vilket samarbete finns det uppströms/nedströms i försörjningskedjan? Är samarbete viktigt?

6. Vilka områden kan förbättras vad gäller hanteringen av uttjänta e-produkter?

7. Vilken roll spelar branschföreningarna (El-Kretsen och EÅF) i utvecklingen av returlogistik?

Questions for RBAI

1. Which supply chain actor is most important for development of reverse logistics of Bosch?

2. What role do your competitors play in the development of reverse logistics for Bosch?

3. Are actions of competitors by any means hindering or stimulating the development of reverse logistics systems for Bosch? How?

4. Is collaboration with competitors important for the creation of reverse logistics systems? E.g. for reaching sufficient return volumes, economies of scale etc.

5. What role has legislation played for the development of reverse logistics for Bosch?

6. Is legislation that aims to reduce environmental impact, viewed as an advantage or disadvantage for Bosch? Why?

7. Is there an issue concerning state to state transportation within India, where legislation concerning import/exports of electronic products imposes constraints on the reverse flow of products? If so, how does this affect the reverse flow of products?

8. How can collaboration with suppliers stimulate development of reverse logistics?

9. How can collaboration with buyers stimulate development of reverse logistics?

10. What kind of take-back obligations fall on actors further down the supply chain (e.g. on retailers)?

11. What happens after a product is returned to a retailer? How does the reverse flow differ for repair of products, remanufacture into *as new* or recycle of products?

12. What kind of pressure is imposed by the consumers in terms of quality, price or environmental concern? And how is it met?

13. Do you have a formalized reverse logistics process? Why or why not?

14. What economic benefits can be gained from efficient reverse logistics system for Bosch?

15. What environmental benefits can be gained from efficient reverse logistics system for Bosch?

16. Does Bosch promote the reverse flow of their goods in order to enhance their corporate image?

17. As directives are created that impose certain requirements for companies, e.g. WEEE-directive, how does this affect current and future development of reverse logistics for Bosch?

18. Which driver (environment, economic, corporate image, legislation) is most significant for the development of reverse logistics system of Bosch and why?

Questions for Pavan Murthy

1. Which supply chain actor is most important for organizations in order to develop reverse logistics in India?

2. What role do you think competition of companies play in the development of reverse logistics?

3. Is competition by any means hindering or stimulating the development of reverse logistics systems? How?

4. Do you think that collaboration amongst competitors is important for the creation of reverse logistics systems? E.g. for reaching sufficient return volumes, economies of scale etc.

5. What role has legislation played for the development of reverse logistics?

6. Is legislation that aims to reduce environmental impact, viewed as an advantage or disadvantage for companies? Why?

7. Is there an issue concerning state to state transportation within India, where legislation concerning import/exports of electronic products imposes constraints on the reverse flow of products? If so, how does this affect the reverse flow of products for organizations?

8. How can collaboration with suppliers stimulate development of reverse logistics in India?

9. How can collaboration with buyers stimulate development of reverse logistics in India?

10. What kind of pressure is imposed by the Indian consumers in terms of product quality, price or environmental concern? And how is it met?

11. What economic benefits can be gained from efficient reverse logistics systems?

12. What environmental benefits can be gained from efficient reverse logistics systems?

13. Do organizations promote the reverse flow of their goods in order to enhance their corporate image?

14. As directives are created that impose certain requirements for companies, e.g. WEEE-directive, how does this affect current and future development of reverse logistics?

15. Which driver (environment, economic, corporate image, legislation) is most significant for the development of reverse logistics systems for organizations and why?

Questions for RBDS

1. Which supply chain actor is most important for development of reverse logistics of Bosch?

2. What role do competitors play in the development of reverse logistics for Bosch?

3. Are actions of competitors by any means hindering or stimulating the development of reverse logistics for Bosch? How?

4. Is collaboration with competitors important for the creation of reverse logistics systems? E.g. for reaching sufficient return volumes, economies of scale etc.

5. What role has legislation played for the development of reverse logistics for Bosch?

6. Is legislation that aims to reduce environmental impact, viewed as an advantage or disadvantage for Bosch? Why?

7. Is there an issue concerning state to state transportation within India, where legislation concerning imports/exports of electronic products imposes constraints on the reverse flow of products? If so, how does this affect the reverse flow of products?

8. How can collaboration with suppliers stimulate the development of reverse logistics?

9. How can collaboration with buyers stimulate the development of reverse logistics?

10. What kind of take-back obligations fall on actors further down in the supply chain (e.g. on retailers)?

11. What happens after a product is returned to a retailer? How does the reverse flow differ for repair of products, remanufacture into as new or recycle of products?

12. What kind of pressure is imposed by consumers in terms of quality, price or environmental concern? How is this met?

13. Do you have a formalized reverse logistics process? Why or why not?

14. What economic benefits can be gained from an efficient reverse logistics system for Bosch?

15. What environmental benefits can be gained from efficient reverse logistics systems for Bosch?

16. Does Bosch promote the reverse flow of their goods in order to enhance their corporate image?

17. As directives are created that impose certain requirements for companies, e.g. WEEE-directive, how does this affect current and future development of reverse logistics for Bosch?

18. Which driver (environment, economic, corporate image, legislation) is most significant for the development of reverse logistics system for Bosch and why?