Retrieving Value in Used Textile

A study of Reverse Logistics system in Jönköping municipality

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Abstract

Background: The demand for textile and clothing as well as the raw materials needed to manufacture them is growing. An important amount of used textile is discarded in the trash mixed up with other materials rather than in dedicated containers, and therefore is following a path where they lose almost or all of their remaining value. As presently there is no official system to manage this type of waste, at the contrary of glass, plastic, metal, newspaper and cardboard, municipalities handle the waste in the best way they can, which is currently not optimal.

Purpose: The purpose of this study is to explore the current post-consumer textile management system of Jönköping municipality and how to improve it, in order to increase the collection rate and best retrieve value from it.

Method: To fulfil the research purpose and answer the research questions, this qualitative study employs an embedded single case study. Primary data was collected through in-person interviews, observations as well as field visits of a sorting facility and recycling centre. Secondary data was also included in the research using web sources and reports from different agencies. Afterwards the empirical data was analysed following a thematic analysis and put in relation with the theoretical framework.

Conclusion: The current way of managing textile waste in the municipality of Jönköping can clearly be enhanced. There are few actors handling the used textile disposed by the households. June Avfall & Miljö is participating indirectly by collecting the garbage of the citizens where most of them are thrown away, the charity organization Human Bridge which is allowed by the municipality to place its textile containers throughout the city, and to a lesser extent the second hand stores Myrorna and Erikshjälpen as well as another charity organization, the Red Cross. Several possible improvements have been identified, namely enlarging the accessibility to households, increasing their awareness and knowledge, developing collaborations between municipalities and the different actors, setting up an IT system and finally via a legislation.
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Abbreviations

EC: European Commission
EoU: End-of-use
EU: European Union
EPR: Extended Producer Responsibility
FTI: Förpacknings & Tidning Insamlingen
HRB: Household Recycling Behaviour
MSW: Municipal Solid Waste
RL: Reverse Logistics
SCM: Supply Chain Management
SEPA: Swedish Environmental Protection Agency
WEEE: Waste Electrical and Electronic Equipment
3PRLP: Third-Party Reverse Logistics Service Provider
1. Introduction

In this chapter, we provide a background regarding issues about textile waste, with a focus on the Swedish context. Following the background information, we present the problem that arises and drives our research. Next, the purpose of the research is stated here and leads to the elaboration of the research questions. Finally, we conclude this chapter with the related scope and delimitations set for the study.

1.1 Background

The current industrial growth and the mass-consumerization of the society is putting pressure and strain on the natural resources of the Earth, and for the welfare of the environment making what we consume under control becomes a critical issue. To overcome such concern, it is thus the responsibility of everybody to take part in the protection of the planet by acting in a responsible and more environmentally friendly way, whether it is companies or people. On the one hand, organizations can for example reduce the packaging they use for protecting their products, use more recyclable materials, decrease their CO2 emissions or take back their products from the consumers through reverse logistics schemes. On the other hand, people, so consumers, can help in protecting the environment by for instance reducing their power consumption or throwing away and sorting out their waste in the right trashes put at their disposal for improved recycling processes.

Accordingly, a rising attention to the recycling and management of waste has taken place with the increasing predominance of end-of-life take-back laws (Toffel, 2003) which stipulates that such goods must be recycled and not disposed (Grant et al., 2015). The European Union (EU) has embraced several waste and chemical legislative measures such as the Directive 2009/125/EC on Ecodesign, Regulation (EU) No 305/2011 on Construction materials, Directive 2008/98/EC on Waste and Directive 2012/19/EU (WEEE) for electrical products to cite the most important ones (Swedish Environmental Protection Agency, 2016).
However, there has been more and more concerns about textile as it is a major economic sector and the resulting waste, which is among the most harmful considering its environmental impacts since it includes hazardous substances. In 2001, textile and clothing was the world’s second-biggest economic activity ($353 billion) and accounted for 7% of world exports. Also, the textile and clothing sector accounts for 3% of total manufacturing value added in Europe (European Commission, 2013).

In Sweden, the Environmental Protection Agency (SEPA) is responsible to establish treatment programs for managing hazardous waste, and in its prevention plan has focused on four waste streams that have a substantial environmental impact: food, electronics, construction and demolition waste, and also textiles (Avfallskaraborg, 2016). In this thesis we will concentrate solely on the latter.

In the last few years, producers and retailers focused their effort mostly on improving the social aspects of textiles e.g. establishing and ensuring fair and safe working conditions, setting social standards, establishing minimum salaries, imposing a ban on child and forced labour, etc, and less on the environmental impacts, even though there have been growing concerns over the years (European Commission, 2013). Toxic materials, raw material exploitation or the high level of textile waste disposed on the landfills have important impacts on the environment (Choi et al. 2015). According to a EIPRO study (Environmental Impact of Products), clothing alone is responsible for 2 to 10 % of the European Union’s life-cycle environmental impacts, placing textiles fourth in the ranking of product category which causes the biggest environmental consequences, after food & drinks, transport and housing (European Commission, 2013), as raw materials, water, energy and chemicals are needed to manufacture them.

Also, the consumption of new textiles is increasing every year. Either as a raw material or as a semi-finished or end product, textiles are assimilated into a large range of products used in different domains and for different purposes. Specifically, fast fashion retailers focus on increasing the number of collections per year, promoting fast changing trends, and therefore causing the consumers to follow the movements of the market in order to buy as often and much as possible. In the meantime, fast fashion retailers offer their collection at a low price because they source the products in low-cost countries (Bly et
al., 2015; Choi et al., 2015). Additionally, the products are not durable because of the low quality. As a result, consumers tend to buy even more disposable fashion (Joy et al., 2012).

Pushing disposable garments into the market is responsible for one of the main problems in fashion and clothing industry: the textile waste (Claudio, 2007). Thus, by recycling worn out textiles or reusing them instead of buying new ones, the consumption of materials needed to manufacture the different kinds of textiles can be reduced drastically (IVL Svenska Miljöinstitutet, 2015). Currently Swedish consumers buy an average of 12.5 kg of textiles per person per year, but nearly a fifth of those are collected when they are no longer used (IVL Svenska Miljöinstitutet, 2015).

Obviously, it is only possible to reuse or recycle solely if the textiles are collected. Hence, to increase the collection rate, a management that strengthens the credibility and supports the major players in the textile market is essential (IVL Svenska Miljöinstitutet, 2015). Today, in the Nordic region (Denmark, Finland, Norway, Iceland and Sweden), reverse logistics processes of textiles such as the collection, reuse and recycling are not regulated, meaning there is no legal obligation for producers nor for municipalities to handle the waste. To counter this and lower the rate of new materials used during the production, a new law in Sweden about textile management is coming up which will assign the property and therefore the responsibility of handling the reverse system for textile waste either to the municipality or to the producers.

**In its proposal from 2013, the SEPA suggested the following goals to be reached by 2020:**
- The cycle of textiles has to be the most resource-efficient possible and do not contain toxic materials.
- 40% of textiles on the market will be reused
- Textiles on the market have to contain 25% of recycled materials

**Moreover, the agency proposed the ensuing goal for 2018:**
- Easily accessible collection systems have to be provided to ensure that higher volume of textiles is recycled
As there is currently no assigned owner of textile waste, it is thus the municipalities which handle it since the Extended Producer Responsibility (EPR) does not apply yet for this type of material. EPR is defined by the Organization for Economic Co-operation and Development (OECD) (2001, p.18) as “[...] an environmental policy approach in which a producer’s responsibility, physical and/or financial, for a product is extended to the post-consumer stage of a product’s life cycle”. Kostecki (1998) further described it as “initiatives where fashion brands are involved with product take-back, reselling, recycling, downcycling and upcycling activities are referred to as product stewardship or EPR”.

1.2 Problem Statement

In this section we need to address the problem faced by municipalities in Sweden regarding the management of waste, especially textile, as there is no national system for managing it yet.

The amount of waste countries produce in the EU is still increasing. However, the materials needed to supply the growth in consumption are in scarce quantity. Therefore, effective, economic and safe disposal of Municipal Solid Waste (MSW) is a significant issue on the agenda of developed and developing countries (Beukerering et al., 1999). The US Environmental Protection Agency (2017) defined MSW as “waste which consist of everyday items such as packaging, furniture, clothes, bottles, cans, food waste, newspapers, appliances, electronics, batteries and grass clippings”.

In Sweden, MSW is managed by municipal authorities or contractors if they outsource it, who are responsible for waste collection, transport and disposal (Adila Batool et al., 2007). In the case of textiles, EPR is a new phenomenon and textile waste has not been regulated from the producer perspective (Morana and Seuring, 2007).

Sweden has producer responsibility for: recyclable paper, packaging, electrical and electronic waste, tyres, cars, batteries and pharmaceutical products, which means producers are responsible for collecting and disposing of end-of-life products and there must be suitable collection systems and treatment methods for recycling. Producer
responsibility is also intended to encourage producers to design and manufacture products that are less resource-intensive, easier to recycle and do not contain harmful substances to the environment (Avfallskaraborg, 2016). Textile is a material that does not belong to the producer responsibility legislation, hence the waste has to be managed by other actors, such as municipalities or charity organisations. Therefore, municipalities must have a waste management plan and are responsible to collect and dispose any household waste not covered by producer responsibility as well as for its transport to waste treatment plants for recycling or disposal to landfill (Avfallskaraborg, 2016).

In 2015, the quantity of household waste treated in Sweden was 4,703,790 tonnes. Taking the whole population, every Swedish citizen produced 478 kg of household waste, 50.6 percent of it was treated through material recycling (Avfallskaraborg, 2016). All EU member states must have national programs to reduce the amount of waste and quantity of hazardous substances in the waste they generate as introduced in the Waste Framework Directive revised in 2008 by the European Commission (EC) (EC, 2010). In Sweden, it is the Environmental Protection Agency (SEPA) which is responsible to set up management plans and guidelines to follow. In 2014, textile waste itself represented 2.320 tons and in 2015, 1.760 tons (Avfallskaraborg, 2016). As mentioned before, textile is a material that has received further environmental focus and is increasingly collected separately, generally in partnership with non-profit organizations for reuse or recycling of textile fibres (Avfallskaraborg, 2016).

However, the market for recycled garments and fibres is still weak due to poor return systems and absence of convenient and accessible bins or tanks for unwanted clothing/textiles in many countries (Sweden included), which results in perfectly useable garments sent to landfill or incinerated (European Commission, 2013). In addition, planned recycling of textile on a countrywide scale or even in major cities of Sweden does not exist yet, resulting in the Swedish government tackling this issue and presently preparing a new law regarding the management of this material, setting up targets to be reached concerning the percentage of textiles to be recycled and used in the production of new clothes for example.
Accordingly, the problem presented in this study is that most used textiles discarded by citizens in Sweden are currently mixed with other materials which lose their remaining value and no formal system is really implemented at a national scale resulting in municipalities handling the treatment of textile not in an optimal way.

1.3 Purpose of the Research

In the context of the preceding background and research problem, the focus is laid on the textile waste thrown away by consumers and particularly on the reverse logistics processes such as on the disposal, collection and sorting of post-consumer textiles waste by the different players in the system. Consequently, the purpose of this thesis is:

‘To explore the current post-consumer textile management system of Jönköping municipality and how to improve it in order to increase the collection rate and best retrieved value from it.’

Simultaneously possible challenges and enhancements should be identified. To serve the purpose of this research, a case study is conducted to identify the key players in Jönköping municipality, their role and key activities to formulate suggestions in order to optimize the logistics processes performed.

Accordingly, the purpose of our research leads to the following research questions:

\[ RQ1: \text{How is the current textile waste management system of Jönköping municipality performing and how is the value retrieved?} \]

\[ RQ2: \text{How can the current system be improved to increase the collection rate?} \]

1.4 Scope and Delimitations of the Research

1.4.1 Scope of the Study

This thesis is conducted within the scope of business administration and oriented towards the Supply Chain Management (SCM) field. SCM is a broad area of study and in order
to narrow down its extent, limitations in our research are determined. The scope is shown below with the help of an onion. (cf. Figure 1).

Figure 1: Scope of the Study

As exposed in the outer layer, the overall matter is reverse logistics (RL). According to Johnson (1998), reverse logistics is «the continuous logistic process through which shipped products move from the consumer back to the producer for possible reuse, recycling, remanufacturing or disposal». RL is associated with the disposal, collection, sorting, reuse and recycling of products, and each one of them is a process in the reverse flow. In this background, those processes are performed by the Waste Management System of municipalities handling the garbage and thus are relevant regarding the scope of the study. Also, the focus lies on the treatment of textile carried out by the different actors in the system, and how value can be retained and reused for other purposes from it.
1.4.2 Delimitations

There are several limitations concerning the research:

1. The study is geographically limited as it focuses solely in the Swedish context. No other countries are part of it. In addition, municipalities can have different ways of textile treatment after the disposal by consumers as there is no plan or legislation at a national level for it yet, and therefore only one case (municipality) is explored.

2. As specified above, there is no national plan or legislation yet, so there can be modifications in the targets to reach or new actors involved once the study is complete and therefore the results we found might be affected.

3. The research is limited to textile waste from consumers, in this manner industrial textile waste will not be part of it.
2. Literature Review

In this chapter, we establish the frame of reference which serves as a basis for this thesis. We start by introducing the concept of Reverse Logistics in which our study lies. Afterwards, several subsections are presented in order to obtain an overview about the important aspects and current knowledge necessary for our research.

2.1 Reverse Logistics

RL is a research area about managing the recovery of products when consumers no longer desired them (end-of-use products, EoU) or are at the end of their life cycle (end-of-life products) in order to retrieve their remaining value (Rubio and Jiménez-Parra, 2014). The growing interest in RL has been mainly due to the increase of activities of the biggest sectors such as transport, electronics, textiles, etc (ibid.). At the time, the main motivator to implement RL was the scarcity of resources. Nowadays, the development of advanced technology and use of cheap materials led Western countries into the mass consumption and “throw away culture” (De Brito and Dekker, 2002).

RL relates to « activities associated with the handling and management of equipment, products, components, materials or even entire technical systems to be recovered » (De Brito and Dekker, 2002, p. 1). The main goal of a reverse logistics process is to recapture the value of returned materials or provide the means for appropriate disposal (Rogers and Tibben-Lembke, 1999; 2001).

There are three main reasons for implementing a RL system. Economic with direct reasons such as a decrease of raw materials and cheaper disposal costs for example and indirect (environmentally responsible behaviour). Legal, as with legislation producers have to take care of the waste generated by their products such as for example with the WEEE legislation of electronics products mentioned before, and social with the growing demand for being more environmentally responsible for companies, especially regarding the carbon emissions and waste generations (Salomon et al., 1995; De Brito and Dekker, 2004).
Krikke et al. (2004) defined four types of returns. End of life returns is when the life cycle of the product has come to an end. Commercial returns include wrong orders, customers not satisfied with their purchase, defects, etc. End of use returns are typically replacement of products when new ones of the same category have been released, end of lease or trade-in and reusable items are containers, pallets, recycled bottles, and so on. Textile waste handled by municipalities can be included in end-of-use or end-of-life returns.

In addition, Fleischman et al. (2001) differentiated two kinds of reverse structures, namely reverse supply chains and closed-loop supply chains. Reverse supply chains comprise the recovery of products attained with repairing, remanufacturing or recycling. A closed loop supply chain, on the contrary, integrates both forward and reverse supply chain activities.

One under-investigated area in RL is how to deal with “end-of-life” or “end-of-use” products (Bing et al., 2014; Ritchie et al., 2000; Xie and Breen, 2014), especially regarding recycling or disposal of them (Mishra et al., 2012). Also, local authorities waste systems are neglected in the reverse logistics literature as compared to commercial reverse logistics systems (Ezura A. Jalil et al., 2016). As stated by Jahre (1995), reverse logistics systems for recycling start with the consumer and finishes with the end market. Oom Do Valle et al. (2009) added that these RL systems can be complex if they also have intermediary levels such as a collection level, a transfer level and a processing level.

Lastly, performance in a reverse system can be related to logistical cost such as the collection cost, as well as customer service, for example the service towards end-consumers (households) and endmarkets (recyclers) (Jahre, 1995).

2.2 System Thinking

2.2.1 Systems

A system might be defined as “a set of components that work together for the overall objective of the whole” (Haines, 1998). Dating from the first half of the twentieth century, “system ideas” arise from biology based on ideas of organisms. A system is a complex
entity as Checkland (1982) states, an abstract concept that must be seen as a whole and not as an aggregate of the different parts that compose it. Other authors such as Bertalanffy (1972) share the opinion, considering a “system” as a group of elements in interrelation with the environment as well as among themselves. Stressing the need of understanding the relations existing among the different elements and not only the parts that compose the system, the entire system needs to be explained in its totality, with focus on the whole and the parts of it in a secondary position (Bertalanffy, 1972).

2.2.2 Characteristics of Systems

The fundamental characteristics of a system are openness, interrelationship and interdependence.

- **Openness:** Every system might be categorized either as open or closed. Open systems get inputs from the environment, work on the inputs, creating outputs that will be released back into the environment. There is always communication with the environment and the system is interlinked. On the other hand, a closed system remains isolated without interaction with its environment, with no influence of one element on the others (Haines, 1998). In an open system, Haines (1998) stresses the interaction with the environment that leads to a transformation: from the inputs to the outputs. Feedback has its importance since the information regarding the processes or the outputs is directed back into the system in the form of input, allowing to change or adapt the processes.

- **Interrelationship and interdependence:** the change of an element part of a system will have an impact on other elements from the system and might alter the whole system as well as other systems interdependent (Haines, 1998).
2.2.3 Types of Systems
Coming from the engineering field, systems might be categorized as “White Box” and “Black Box” systems (Kasianiuk, 2016). The particularity of a White Box system is the relations and links that are set among the different elements that form the system. The focus is on the actors involved and their interconnections among them. In order to understand the system, every single element must be studied and understood.
Regarding Black Box models, there is no information available about the functioning of the processes operating inside. The environment is part of the model; though it is not shown. The environment is considered as “the source of impulses towards the system and a field of reception of the system’s reactions” (Kasianiuk, 2016).

Therefore, the system can only be evaluated regarding the function of transformation that takes place in the system, changing the inputs into outputs. The way to understand how the system works is deducing from the operations that transform inputs into outputs.
Two different perspectives lie behind each one of the presented systems. If the focus is on the system as a whole, the Black Box system is the most appropriate. On the other hand, if the focus is on the different elements and their interconnections, the White Box system is a best match (Kasiаниuk, 2016).

2.2.4 General Systems Theory
Developed from the study of biology in the 1920s, General Systems Theory refers to “a way of thinking about” or “an approach to studying” complex systems (Bertalanffy, 1972). The principal objective of General Systems Theory was to develop general standards or frameworks that would be possible to apply in several areas of science, allowing to share knowledge among specialist (Boulding, 1956). Later on, Bertalanffy (1972) approach was in the same direction, aiming to develop the principles applying to systems in general, in order to get a classification, and therefore develop models that will unify science. In another words from Vickers (1970), “the task of General Systems Theory is to find the most general conceptual framework in which a scientific theory or a technological problem can be placed without losing the essential features of the theory or the problem”.

2.2.5 System Thinking
Systems thinking has been developed from General System Theory and in the words of Checkland (1981) is “the process of thinking using system ideas”. More detailed, the author defines a system as an “adaptive whole” comparing it with living organisms that adapt to environments that change being a whole entity. For other authors, such as Senge (1990), system thinking is “the discipline for seeing wholes.... Today we need system thinking more than ever because we are being overwhelmed by complexity.... System thinking is a discipline for seeing the structures that underlie complex situations”.

A new form of understanding the world and a way of thinking in which the whole unit is first with the relationship with the environment as a main concern (Heines, 1998) or “System Thinking is the art and science of making reliable inferences about behavior by
developing an increasingly deep understanding of underlying structure” (Richmond, 1994).

Based on the concept of “adaptative whole”, system thinking seeks to explore how the concept might be applied in other fields (Checkland, 1981). Furthermore, Checkland (1981) suggests four core ideas in system thinking, namely: emergent properties; layered structure; processes of control and processes of communication.

With emergent properties, the stress is on the necessity of seeing the system as “more than the sum of its parts”, being only possible to find these properties in the system, not in an individual level. In the same way, systems might have within them sub-systems or be part of bigger systems, bringing up the concept of layered structure.

The environment in which systems are located might change and therefore the system needs to develop processes of communication and control in order to survive to these changes (Checkland, 1981).

2.3 Reverse Logistics Network Design

KKR (2003) defined a network as « participants having common ambitions, benefiting from joining, participating on equal grounds and voluntarily, organizing the network themselves, having dynamic meetings, and planning the time for the meetings »

According to Rubio and Jiménez-Parra (2013), designing a RL network is the most difficult aspect of RL to realize. The design of an RL network is based on three processes. First, the collection of EoU products is the starting point of the system, and three distinct collection options exist depending on whether it is performed directly by the manufacturer, by the distributors or retailers or through third-party logistics providers (Corminas et al., 2013). Second, the inspection and classification. The management of product recovery deals with the uncertainty about how many products will be return, in what quality and when they will be returned. These two activities will determine the condition of the returned products. Finally, the recovery process, which can be considered as the most important aspect of the RL network, as it retrieves the economic value of the
returned products through either the reuse, remanufacturing or recycling (Rubio and Jiménez-Parra, 2013). Alumur et al. (2012) highlighted that configuring a RL network is a complex problem that necessitates to determine the optimal locations and capacities of the collection centres, sorting facilities, remanufacturing amenities and recycling plants.

Besides, a range of logistics design factors (distance, bins, information, engagement, convenience, collection schedule, etc) have an influence on the recycling behaviour, the situational factors, which are as explained by Ezura A. Jalil et al (2016), the physical characteristics of the RL system, and is controlled by the Local Authorities (LA) and influences the extent to which households adhere. These factors can also be considered as “hard” factors that can be quantified and measured (Caplice and Sheffi, 1994). The degree to which the success of RL operations are affected by Household Recycling Behaviour (HRB) is determined by the extent to which RL design involves collection of co-mingled recyclables or whether source separation is encouraged by LA within the household (Bing et al., 2014).

When the objective of LA RL services in a Household Waste Recycling System (HWRS) is to increase the proportion of recyclables relative to the amount disposed of in landfill or by incineration, it is essential to understand what relationship lies between LA-controlled factors, that is “situational” as explained before, and household characteristics and behaviour factors, that is “personal” (Ezura A. Jalil et al., 2016). A main challenge to realize completely the potential of curbside recycling is to select curbside recycling scheme designs in a way that the understanding of householders’ recycling behaviour by LA is applied effectively (Woodard et al., 2005) and adapted to local conditions (Mattsson et al., 2003).

According to Ekström and Salomonsson (2014), one important question to determine is: *To what extent is the consumer willing to sacrifice time sorting the clothes for reuse and recycling rather than throwing it in the garbage?* Answering this question will have an impact on the design of the future reverse logistics channel of the textile waste management system of municipalities.
2.4 Value Creation

According to Feller et al. (2006), value is a subjective experience when customer’s needs are met by providing products, services or resources, and value depends on the context. It occurs when the needs of customers are satisfied through a trade of products or services in exchange of a payment.

In 1998, Michael Porter introduced the concept of value chain, which he defined as “a system for analyzing the sources of a firm’s competitive advantage by describing and evaluating all functions that create or add value to a product or service that is delivered to the customer”. These internal critical activities are responsible for the overall strategic success of a company. Value activities are “the basic, technologically and strategically distinct elements, which are performed by a firm to create a valuable product or service for the customer” (Strähle and Matthaei, 2017).

According to Porter (1998), each value activity can be categorized into direct, indirect, or quality assurance activities. Direct activities are directly involved in the value creation process, while indirect activities continuously support direct activities. Moreover, Porter described quality assurance as the quality of each step in the value chain by for example monitoring, reporting, or testing.

Porter (1998) also differentiated primary activities from support activities that are divisible into sub-divisions. Primary activities are client facing and directly contribute to the margin, product creation, sale and maintenance of the products or services. He classified these activities into five categories: inbound logistics, operations, outbound logistics, marketing and sales and service.

Inbound logistics include the supplier relationships and all activities that are necessary to receive, store, and dispose the inputs. Outbound logistics complement these activities by collecting, storing, and distributing the outputs or finished goods to the buyers. The final activity of the primary value chain is the service, just after the customer bought the product. This activity operates as the service “to enhance or maintain the value of the product”, for example a repair service, customer care institution or the installation (Porter, 1998).
Porter (1998) discerned between firm infrastructure, human resource management, technology development, and procurement. He explained that the infrastructure supports the entire value chain, while the other three support components can be associated with specific primary activities and also support the entire value chain. The technology development involves the know-how required, implemented procedures and processes or the design as well as the technological equipment that is necessary.

By applying the analysis tool created by Porter (1998), activities that create value to customers can be identified. It shows how value is added at each category and activities can be evaluated and adjusted if necessary that would generate more value or efficiency.

Figure 5: Value Chain activities, adapted from Michael Porter (1998)

The Ellen MacArthur Foundation introduced a system of “four powers” that work as sources of value creation and increases the productivity of material within a circular economy model: the power of the inner circle, the power of circling longer, the power of cascaded use, and the power of pure circles (Ellen MacArthur Foundation, 2013). The power of the « inner circle » depicts the principle of minimizing the use of material within the value chain. The power of « circling longer » aims at maximizing the number of times a product or material is reused, remanufactured or recycled and thus maximizing the
number of cycles. The power of « cascaded use » suggests that the way of reusing a product or material within a value chain should be diversified. The power of « pure circles » indicates that environmentally-friendly and clean materials improve the ability of reselling or reusing the products (Ellen MacArthur Foundation, 2013).

2.5 Waste Management Hierarchy: Prevention, Reuse, Recycling, Disposal

The directive on the landfill of waste of the European Commission (EC) (1999) required a significant reduction in the quantity of biodegradable municipal waste disposed to landfill and imposed targets to reach. A Waste Management Hierarchy set up by the EC from the Waste Framework Directive (2008) was established with various levels regarding their impact in terms of carbon dioxide. It discloses when waste ceases to be waste and becomes a new source of raw material and how to discern waste and by-products.

![Waste Hierarchy](image)

*Figure 6: Waste Hierarchy, adapted from (European Commission, 2008; Mannall and Chinn, 2011)*

Fletcher (2008) suggests that the most common approach to handle waste emerging from
the textile industry is to carry out waste management strategies, for instance reuse, reduce and recycle, which happen at the end of the manufacturing chain of clothes.

2.5.1 Prevention
The prevention of the creation of waste is the first step in the Waste Hierarchy. It is the priority in the Swedish waste legislation as well as in the European one (Avfallskaraborg, 2016). The largest benefit is achieved in this phase by either reducing or eliminating the demand (Mannall and Chinn, 2011). Therefore, a good waste management begins with the prevention of waste being produced (European Commission, 2010).

As stated by the European Commission (2010), the prevention of waste is growing and becoming increasingly important due to the expansion of the population and the decrease in raw materials. To counter this and encourage waste prevention, a concept is to create eco-friendly products made with recycled materials and without hazardous substances. In addition, the products should be less energy-consuming and be able to be recycled after the end of their life cycle.

In order to facilitate the prevention of waste, member states ran advertising campaigns to educate people and encourage consumers to demand more environmentally-friendlier products which could “force” companies to make greener goods (ibid.).

2.5.2 Reuse
Morley et al. (2006) described reuse as “the use of the original product function”. As a complement to Morley et al. (2006) description of reuse, Chan et al. (2015) defined it as “selling, exchanging, or giving away the used clothes or fashionable items”. Mannall and Chinn (2011) explained that reuse should have the benefit of reducing the quantity of new products manufactured.

Ekström and Salomonsson (2014) stated that the quality of fast fashion items is often too low for further reuse. They also added that manufacturers do not always design clothes for recycling. In their study, Ekström and Salomonsson (2014) discussed the importance in the future for industrials in the clothing industry to manufacture clothes of better
qualities, which last longer and are therefore more appropriate for reuse. In the stage of designing the products, the end-of-use has to be taken into consideration, particularly if the clothing is intended to be resold and thereby reused (Dickson et al., 2009). A long-lasting quality and a timeless design are essential when the clothes should be remarketable and numerous life cycles of products should be realized (Fletcher and Grose, 2012; Kant Hvass, 2014).

2.5.3 Recycling
From a historical viewpoint, according to Ekström and Salomonsson (2014), the recycling of clothing and textiles was common in the making of rugs, mattresses and furniture. Despite the diminution of this practice over time, due to environmental and economic considerations, it can be expected to increase in the future, for example with an increase in the price of raw materials such as cotton.

Material recycling means that separated materials can replace other production materials or construction materials (Avfallskaraborg, 2016). Morley et al. (2009) defined recycling as the use of the material properties. It has a major role in a sustainable society. It is also crucial that waste is viewed as a resource and be handled properly (Avfallskaraborg, 2016). Jahre (1995) explained that the recycling process is essentially compound of two stages. The first one is the collection service stage and involves all the necessary procedures that make the recyclable waste possible for further reprocessing. The second one is the reprocessing stage from the collection of materials to the replacement of primary raw materials. The outcomes of recycling materials lead to a reduced environmental impact through a reduction in the consumption of virgin material and uses much less energy compared to other methods of waste treatment and disposal and saves natural resources (Vencatasawmy et al., 2000; Van Beukering and Bouman, 2001; Gaines and Stodolsky, 1993; Stodolsky and Mintz, 1993). However, recycling is successful only if the recyclables produced can compete with primary materials in price as well as in quality. The quality is widely determined by the way activities, such as collection and sorting, are performed (Jahre, 1995). Using new materials in the processing usually requires more energy than the recycling process (Adila Batool et al., 2007). Handling materials for recycling is nevertheless not without environmental repercussions, which
derives from the energy required for their collection and sorting as well as those associated with the utilization of recovered materials in producing new products. However, these impacts are much lower than the ones associated with uncontrolled waste generation, handling and disposal (Adila Batool et al., 2007). Also, recycled fibers for production are cheaper than new raw materials. However, a problem that arises is the poor quality of fibers from recycling for use in the textile industry (Ekström & Salomonsson, 2014).

In addition, a well-structured and executed recycling program can help to reduce the amount of waste, its disposal and treatment cost (Kelley, 1992; Reams and Geaghan, 1996; Agunwamba et al., 1998; Bhattarai, 2000; Koli and Mahamuni, 2005; Singhal and Pandey, 2001). Furthermore, Beullens (2004) and McLeod et al. (2008) stated that MSW management services can have a big impact by increasing levels of recycling and decreasing the amount of MSW being sent to landfill or incineration.

Planned recycling is more profitable in countries where the value of recovered materials is higher and where low wage cost of recovery and recycling compensate for the relatively small proportions of recyclables waste that can be recovered from MSW, as for instance paper, plastic, glass, ferrous (Johnsons et al., 1984; Beukerering et al., 1999). Oom do Valle et al (2009) added that for recycling to be economically feasible, a considerable amount of discarded products (or parts) need to be processed. Lastly, Jahre (1995) pointed out that research showed that logistics costs account for a large part of the total costs of recycling.

2.5.4 Energy Recovery
Energy recovery is a method ideally appropriate for waste which cannot be recycled in any other way. In the meantime, the recovery of energy generates both district heating and electricity (Avfallskaraborg, 2016). The primary energy production from municipal waste incineration has more than doubled since 1995. Waste can also be utilized as fuel for some industrial processes (European Commission, 2010).
Incineration plants for energy recovery have to follow strict conditions set by the EU before burning waste, especially those containing hazardous substances, in regards to reduce environmental damages. The legislation determined certain values for emissions not to exceed and thresholds for the energy efficiency of waste incinerators (European Commission, 2010). Energy recovery using incineration is a preferable method for handling used materials, notably the ones releasing chemicals or difficult to burn (ibid.).

2.5.5 Disposal

Prothero et al. (2011) claimed that there is relatively little research on when and how to dispose of a product, and when disposal can lead to a substitute usage by another person. A Swedish study revealed that 21% of people dispose of clothing because they are tired of them (Ungerth 2011). Another study by Birtwistle and Moore (2007) among fashion consumers further indicates that fast fashion promotes a “throwaway culture” where garments have lost their intrinsic value and supports consumers to replace and dispose of clothes before their real life cycle has ended. The fast fashion retailer H&M affirmed that for example textiles represent 5% of the landfill produced in the USA and 95% of the discarded textiles are still recyclable (Hennes and Mauritz AB, 2013). These numbers disclose that a considerable part of the value created in the fashion industry is just thrown away and textile recycling is still a less investigated topic (Strähle and Mattaei, 2017). Notably when the clothing is cheap and not qualitative, consumers simply discard the old garments (Goworek et al. 2012). Another study by Ha-Brookshire and Hodges (2009) broke down the form of disposal into four categories: discarding the used product by throwing it away, giving or selling the used garment to a second-hand shop or to another person, donating it to charity organizations, or loaning the item.

2.6 Other important RL processes: Collection and Sorting

2.6.1 Collection

The volume of collected clothes and textiles must increase in order to decrease the quantity that alternatively ends up in the garbage. An important increase in the volume is necessary in order to build a new textile recycling industry that creates new products from recycled materials, which would decrease the need for new raw materials, as the current
volume is too small for establishing an economically sustainable recycling industry. Clothing and textiles also need to be collected continually in order to make it economically feasible (Ekström and Salomonsson, 2014), as it is done for example with the papers, cans and glass throughout Sweden. Collecting and handling costs of used clothes in Sweden are high, compared to low wage countries such as Bangladesh, Vietnam where most producers have their manufactures. As a result of the increasing economic value of textiles, there is a growing interest of many actors today for collecting clothes and textiles that consumers no longer want (ibid.). Charitable organizations have traditionally received those kinds of clothes, nevertheless, clothing companies have also started to run campaigns to receive used textile (ibid.). Collection activities necessitate other equipments, for instance separation facilities and special collection vehicles (Jahre, 1995). Furthermore, a collection program where materials are taken from the consumer to a transfer site for reloading and then on to another one for processing are more complicated than a collection system where they are taken directly from consumers to the processing point (ibid.).

Moreover, Jahre (1995) added that if collected materials are delivered by the consumer to a specified point, as for instance a drop-off centre, therefore this point is defined as the collection level. As explained by Jahre (1995), two variables shape the service level of the scheme, the average transport distance to the consumers from the point of consumption to the point of collection and the number of households covered by one collection point. It shows whether it is a bring scheme where consumers have to travel a long distance to the collecting or sorting site, or a kerbside scheme where they have a relatively short distance to ride as they are more collecting points (household places) than the previous type of scheme (drop-off or retailer centres). The flow of garments will be more complex in the kerbside system than the bring one, as there are more distribution points to cover. This complexity may be diminished by the way collection is carried out. On the one hand, there is the segregated collection, if one vehicle collects one type of material, and on the other hand, the co-collection, if one vehicle is used to collect several fractions. Co-collection can be performed in several manners such as with multi-compartment trucks or by adopting bags to collect the diverse fractions by using a one-compartment-vehicle to amass them (ibid.). Jahre (1995) specified that the lower the degree of co-collection, generally the higher number of operators, vehicles and
distribution channels, and as a result the more complicated the logistics is. This depends as well on the number of parts separated by the consumers (ibid.).

Place and time postponement can occur in a reverse system. When transferring the clothes from the collection point to the transfer level and from the transfer level on to the processing facility can be postponed (Jahre, 1995). Additionally, postponing the separation and processing activities can happen by moving mixed material from the consumers directly to the processing facility, the last level in the channel (ibid.). According to Jahre (1995), postponement is more suitable for the separation process, as the fractions separated early in the reverse channel, thus by consumers, can be considered as ‘speculation’. Speculation as it is explained in Jahre’s study, appears to have higher collection complexity and lower sorting complexity than postponement, while postponement has lower collection complexity and higher sorting complexity. This is because the more parts sorted at the collection stage, the more challenging it is to collect them, therefore postponing the sorting process later in the reverse channel results in savings in transportation costs (ibid.). In another words, speculation leads to higher transportation costs as smaller volumes of each material are transported from the collection points. This is why Ha-Brookshire and Hodges (2009) asserted that a convenient location for disposing used textile for consumers is essential. Pal (2015) added that the collection through retail stores or dedicated containers is economically feasible only in highly populated areas.

2.6.2 Sorting

The sorting of collected garments and textiles is another hurdle for developing a national system as it is very labor intensive and costly. In the value adding process of sorting, the quality of the used textiles is evaluated and will determine the future use. They can be directly resold as second hand clothes to the consumers, recycled and be used for remanufacturing, or can be exported to developing countries. Items assessed as non-recyclable will have to be incinerated or be discarded on landfills (Kant Hvass, 2014; Pal 2014, 2015). Overall, textile waste is difficult to separate due to the heterogeneity of the materials and colors. New recycling technologies would need to be developed that can generate similar fibers’ quality with used garments and meet the standards required in the
fashion industry (Ekström and Salomonsson, 2014). Technologies for sorting have been implemented and tested in Holland, but need to be developed for operations at a bigger scale (ibid.). A challenge in sorting is that consumers have to learn how to differentiate a good quality clothes because a high price or a famous brand are not necessarily correlated with quality (ibid.). If the waste is separated directly at the collection source, sorting complexity is low and the need for further sorting diminishes. This depends on the number and kind of materials or products collected in the overall system (Jahre, 1995).

2.7 Key components of the reverse flow system: Consumers, Municipalities, Recycling Centres, Third-Party Logistics Providers, Charity Organizations and Second Hand Stores

Actors in a reverse supply chain can be separated into returners, receivers and collectors or processors (De Brito and Dekker, 2002). Any actors can be a returner; in our case the returners of used textiles are the consumers. Receivers can be anywhere in the reverse channel, e.g. retailers, suppliers, etc. Next are the players participating in the collection or processing, which can be independent intermediaries, reverse logistics service providers or municipalities taking care of the waste collection for example (ibid.).

2.7.1 Consumers

Consumers have a crucial role in this reverse logistics system since they are the first link in the reverse logistics chain. Without their participation through the disposing and sorting of recyclable materials, this system would not be possible (Oom do Valle et al., 2009). Anderson and Huge Brodin (2005) stated that within a closed-loop supply chain and participating in the return, recycling or disposal of goods and waste, consumers are a “pivot point node between forward (inbound) and reverse (outbound) flows”, as well as having a critical exchange role in working with a municipality or LA as the “first-tier supplier” in a RL context. Bring et al. (2014) and Enzura A. Jalil (2016) shared the same opinion by declaring that households form a key stage in the RL system as being both a recipient of inbound flows and initiator of outbound flows and being both a source and initial separator of MSW. They are responsible for separating and depositing waste at available collection points and must also follow the municipality’s rules for waste management (Avfallskaraborg, 2016). Households also have a pivotal role in determining
whether end-of-life products will be part of a RL system or be disposed of as waste (Ezura A. Jalil et al., 2016).

Furthermore, it does not require time and energy from consumers to throw away the items they do no longer need into the garbage rather than transporting them to a recycling station or recycling center (Ekström and Salomonsson, 2014). As a result, incentives are of particular relevance in the context of encouraging consumer to separate and properly dispose of household packaging residues for recycling (Oom do Valle et al., 2009). It can also be a hard task for consumers to decide which clothes are of acceptable quality to donate to charities and which can be utilized for recycling purposes. In regard to this confusion and their lack of awareness of used clothes’ environmental impacts, many garments end up in garbage bins (Hvass, 2014). To counter this, Prothero et al. (2011) asserted the role of government in increasing the public’s awareness by educating people about the effects of consumption on the environment in for example developing educational programs in schools, on TV, and through social media. Consumers of all ages need to be addressed. Developing an application for smartphones which indicates where the nearest recycling station or charity store is situated can also help citizens.

2.7.2 Municipalities

Municipalities have to choose by themselves how they want to organize the waste management. Local government autonomy is part of the Swedish Constitution, and there are several organizational structures available: self-administration, municipal enterprises, independently or jointly with other municipalities, joint boards and municipal associations (Avfallskaraborg, 2016). Municipalities also work on promoting the prevention of waste and its recycling, despite this not yet being their legal responsibility (ibid.). Preparation for reuse is also part of their responsibility. The collaboration on reuse at recycling centres with various charity organizations is growing and becoming more and more prevalent. Clothes and other items can be deposited at those centres for future reuse. Half of them accept clothes for reuse (ibid.).

Ezura A. Jalil et al. (2016) mentioned that LA waste systems are neglected in the RL literature in comparison to commercial RL systems. An important priority in the LA waste systems is to define the location of the drop-off systems, (also called eco-points), in order
to supply an easier and more convenient access for the population. In establishing this, the focus should be on aspects such as available support and claim service, more recycling awareness campaigns, and general disposal conditions (cleaning, maintenance, safety, etc) (Oom do Valle et al., 2009). Also, entities that manage the system must weigh the need of increasing consumers’ involvement without compromising the system’s economic viability (Oom do Valle et al., 2009).

The municipalities have a major role to play in implementing and fostering a nationwide recycling system. Ekström and Salomonsson (2014) stated that rules and routines similar to the collection and handling of paper, glass, plastics, and metals should also be developed for clothing and textiles as it is performing well and all municipalities in Sweden should execute the rules about the handling of waste in similar ways. Today, municipalities have the ownership of all the household waste remaining at recycling stations and recycling centers and are free to choose the charitable organization(s) with which to cooperate (ibid.) as textile is not part of the EPR.

Ekström and Salomonsson (2014) also added that municipalities need to acknowledge more the work carried out by charitable organizations and should make it easier for them to get permission for placing collection bins at municipal recycling centers and recycling stations and near residential areas. In addition, municipalities need to know which charities are trustworthy and legitimate. Only those organizations should be allowed to have their collection bins owned by the municipality.

2.8.3 Recycling Centres

Since the 1967 Civic Amenities Act, authorities have been required to provide waste facilities known as Civic Amenity sites for the public to deposit these wastes (DoE, 1975). These Civic Amenities are centralised facilities where residents can also deliver and disposed material in excess of household collection or not accepted as household waste as considered too bulky for example. Sundin et al. (2011) defined recycling centres are «manned facilities for waste collection where visitors can bring, sort and discard worn products as well as large-sized, hazardous, and electrical waste ». They are principally destined to citizens or small companies. Different types of products are disposed into
large containers depending on the kind of material they are formed (wood, garden waste, iron, …). Nearly every product except kitchen waste are accepted at the centres, as it had to be dealt with the curbside collection scheme (ibid.). However, some authorities set a limit on the quantity of material they will accept in household collections (Woodard et al., 2004). The Swedish Waste Management (SWM) mentioned that there are more than 700 recycling centres in Sweden (SWM, 2008).

As the trend regarding recycling is growing, there is also a need to improve the efficiency of those recycling centres. They must be designed with the goal to minimise the rate flow and time visitors spend in it (Sudin et al., 2011). The design and layout should have an easy-to-understand traffic flow and clear signs and direction markers on the roads in order to help visitors to find their correct way (ibid.).

It is important in the sense that society cannot expect citizens to spend too much time waiting at recycling centres, as it will increase the risk that people dispose of their waste in a non-environmentally friendly manner if they find it too annoying to do it there. What is more is that it also impacts the sorting quality, it has to be easy for them to discard the waste in the right containers (Krook and Eklund, 2010). Numerous causes have an influence on the number of visitors and quantity of waste, for example the weather conditions. As a result, recycling centres should be designed to adjust to those changes, such as the number of containers due to seasonal variations or adding new waste fractions in the future. A waste that does not end up in the right containers causes external environmental problems for the further actors in the downstream waste management chain (Krook and Eklund, 2010). In order to counter this, Sudin et al. (2011) recommended to enhance the citizen’s knowledge through the use of more descriptive and readable signs, an information system located on-site to provide advice, inform visitor on how to prepare, sort and dispose of their materials or improve the quality of the service by the municipalities’ employees.

2.8.4 Third-Party Reverse Logistics Providers
Managing the flow of return products necessitates specific infrastructures, IT systems to track the goods and equipment for their processing (Murali et al., 2011). As a result,
companies as well as municipalities can decide to outsource some activities to third-party reverse logistics providers (3PRLP) which have the competences to handle those tasks from managing formerly all types of supply chains.

An important reason when choosing to outsource is to benefit from the competences and experience of the service provider to support in an enhanced manner and cheaper the clients. Common outsourced activities are warehousing or outbound and inbound transportation (ibid.).

Therefore, outsourcing provided a good opportunity to 3PRLP to enter into the reverse logistics market (Rogers, and Tibben-Lembke, 1999). These 3PRLP are specialized in managing the reverse flows and executing value-added services, e.g. remanufacturing. They are expected to have advanced IT systems, transportation and material handling equipment besides warehouse amenities to provide complete solutions for their customers (Kannan et al., 2009). In addition, outsourcing part or all activities related to reverse logistics to 3PRLP may cut down costs as they can benefit from economies of scale that a company or municipalities would not have been able to achieve on their own (Murali et al., 2011).

Also, after having decided which activity to contract out, the selection of an appropriate service provider is required. As there can be an important number of 3PRLP to choose from with different levels of capabilities, this selecting process can be a complex and time-consuming task which requires several decision-making criteria (ibid.). Those criteria can be cost and quality of services, information sharing and trust, reputation of the company, geographical spread and range of services, performance measurement, among many others (Jharkharia et al., 2007).

To be considered a successful 3PRLP, they need to satisfy their clients, maximize asset recovery and the speed of processing the returns as well as minimize inventory levels and processing and monitor costs (Murali et al., 2009).

2.8.5 Charity Organisations

In Sweden, consumers give 3 kg per person per year, so in total 26 000 tons to charitable
organizations (Carlsson et al. 2011). Among them, 73% (19 000 tons) are sent abroad for assistance or sold for export, 12% (3 000 tons) are sold in Sweden and 15% (4 000 tons) are disposed (Carlsson et al., 2011). According to Ekström et al. (2012), consumers often rather give clothes to charity for philanthropic reasons and not necessarily for environmental considerations. A study by Tojo et al. (2012) revealed that more than half of the textiles collected by charitable organizations in Denmark, Finland, and Sweden are exported.

Fast fashion poses a problem for charitable organizations due to the fact that they have to handle an increasing amount of lessen quality clothes (Cline, 2012). Those low quality fast fashion clothes, instead of being sold in their own stores, are compressed and sold to textile recyclers for a lower profit (Cline, 2012). For charitable organizations, handling the no longer needed clothes and textiles has been a normal part of their business for a long time, in some cases more than one hundred years. People may give their items directly to their second-hand stores or put it in special collection bins that are placed throughout the cities and the countryside (Ekström and Salomonsson, 2014). Charitable organizations also collect the clothing and textiles at peoples’ homes or workplaces. Afterwards, the items are sorted manually in terms of quality and the best ones are sold in the second-hand stores (Ekström and Salomonsson, 2014). A large part of what is remaining is essentially shipped abroad, to Eastern Europe, Africa or Asia, where it is sold at the local markets. The items left are shipped to the incineration plants of municipalities where they are converted into energy for the locality heating or electricity.

Lately, several charitable organizations have also tried to cooperate with retail companies in order to increase the amount of collected clothing and textiles (Ekström and Salomonsson, 2014). They also have activities to redesign and remake items. Currently, only the non-profit charitable organizations have a system to collect the clothes and textiles (Ekström and Salomonsson, 2014).

A need exists to achieve a certification and accreditation program for charitable organizations, as it would make easier for consumers to know which charities are trustworthy as well as raising their status of being a responsible charitable organization. In Sweden there is a lack of trust among citizens regarding charitable organizations
Therefore, charitable organizations need to become more transparent, for instance what quantity they collect and what happens with the collected items and the money generated (Ekström and Salomonsson, 2014). Actors which pretend to collect clothing and textiles for a charity purpose when in reality they are collecting to make money is a problem as it erodes people’s trust towards charitable organizations and can lead to a decreased amount of collected material (Ekström and Salomonsson, 2014).

2.8.6 Second Hand Stores
Cervellon et al. (2012) defined second hand clothing as « apparel that has already been used ». Morana (2006) gave another definition and described second hand as « a form of product recycling, which means that a used product is taken into a new stage of usage without changing the product design, only optionally refurbishing it » and ascertained that in this mode the product is reused with the same intended purpose as before. For Roux and Guiot (2008), second hand buying is “the acquisition of used objects through often specific modes and places of exchange”.

According to Chan et al. (2015), second hand fashion was a fashion trend between the 1960s and 1970s. Since then, an informal demand is flourishing and used clothes are sold and exchanged on “second hand markets, flea markets, swap meets and garage sales” (Roux and Guiot, 2008) or with family and friends (Connell and Kozar, 2014). Purchases of second-hand clothing on the Internet are also growing rapidly (HUI Research and Blocket, 2012) which signifies that the period of ownership or the clothing life cycle is shorter than its useful life. User opts for a new clothes and the used ones still serve the purpose. Accordingly, the second hand market is created (Murthy et al., 2008). Their buying intention for choosing second hand apparel are from economic nature and indirectly by environmental consciousness (Cervellon et al., 2012; Guiot and Roux, 2010; Williams and Paddock, 2003). Williams and Paddock (2003) explained that not only price-conscious households but also wealthy households engage in wearing second hand apparel for social or recreational reasons. Cervellon et al. (2012) stated that consumers see the importance in eco-friendly consumption and disposal patterns but not all of them directly associate second hand consumption with sustainable buying practices because of
their lack of knowledge about it. Connell and Kozar (2014) declared that solely consumers with strong environmental attitudes and knowledge about sustainable clothing consumption resort to second hand clothing and are normally motivated to use other textile acquisition and disposal mechanisms.

Second hand apparel is distributed through different formats. In their study about the environmental benefits from reusing clothes, Farrant et al. (2010) asserted that the quality of the used item determines how and where the second hand product will be distributed. According to them, apparels that are in good condition are often sold in the country where it is collected from the initial user via different distribution channels, usually in Western Europe or North America, whereas low-quality garments are exported to developing countries, such as in Africa for example. The rest is sold to recycling companies or ends in the landfill.

Formal distribution channels like permanent second hand stores which offer mono-brand or multi-brand assortments, vintage clothing shops, and charity or economy shops evolve and have nowadays fixed and permanent locations as common stationary retail stores (Chan et al., 2015; Connell and Kozar, 2014). An example of a formal distribution type is the Swedish clothing company Filippa K. which encourages its customers to return their old apparels and sell them in their own-branded second hand store in Stockholm in order to extend the product lifecycle and profit from the remaining value (Filippa 2014). They sort the returned products manually and meticulously. During this kind of sorting process, the collected clothes are categorized depending on their quality into three categories. The highest quality clothes are resold in own stores. The rest is either recycled for remanufacturing or given to charity organizations. Connell and Kozar (2014) added that it also exists retail stores or online platforms where customers can bring back their used items in exchange of a percentage of the money when their article has been sold. eBay is an example of the distribution format of Internet platforms where mainly consumer-to-consumer business for second hand clothing takes place. The demand for similar models is growing (Chan et al., 2015; eBay International AG, 2016), especially channels like formal second hand stores, informal second hand markets, as well as the exchange of worn garments on digital platforms on the Internet is gaining in importance due to the increase in formal demand from buyers, in offers and accessibility of second
hand garments (Pal, 2014; Roux and Guiot, 2008).

Another example is H&M which is since 2013 in cooperation with the global recycling company I:Collect, and proposes a worldwide clothes collection initiative in its retail stores (Godelnik 2012) where its customers have the possibility to return worn clothes that they do no longer need, and drop the garments in big boxes provided. The customers will then receive a voucher for future purchases at H&M which additionally increases their loyalty. A point to take into consideration when second hand stores collect used garments is the fact that the consumers are often not sure if the quality of the clothing is good enough to be resold. Therefore, second hand retailers should assist them in this area (Kant Hvass, 2014).

2.9 Legislation

Currently, in the EU there are discussions concerning life-cycle-based directives for the textile industry, where one possible measure is the Extended Producer Responsibility (EPR) for the full life-cycle of the apparels they sell, which would integrate systems of take-back and post-consumer waste management (Ecotextile News, 2012a).

The governmental organization Swedish Environmental Protection Agency (SEPA) has mapped the flow of textile waste in Sweden. The agency has also put reuse and recycling of textiles as a prioritized area in the Swedish waste plan, meaning that municipalities are bound to take it into account in their waste plans (Ekström and Salomonsson, 2014). They work in collaboration with other governmental agencies in the Nordic countries in order to prioritize the recycling of textile waste and to find goals, indicators, and incentives that can prevent the disposal of textile waste in the garbage or in landfills. An important aspect is to find solutions in cooperation with other actors in the society, as for instance by reviewing environmental enhancements with the clothing industry or by stimulating the development of new technologies for the reuse and recycling of textiles (Ekström and Salomonsson, 2014).

3. Methodology
This chapter characterises the design of the research. To begin with, the research philosophy and approach are presented. After the research method including the research strategy, data collection and data analysis are described. Finally, the research quality with reliability, validity, and generalizability as well as research ethics are specified.

3.1 Research Philosophy

According to Saunders et al. (2015), the term research philosophy “relates to the development of knowledge and the nature of that knowledge”. The authors state the importance of the philosophy behind the design and the connection with the results and the quality of the outcomes that the research would produce. It is important in order to have a creative contribution, and that authors understand their reflexive role in research methods. In addition, a sound knowledge of research philosophy helps regarding research designs with the election of the most suitable option (Easterby-Smith et al., 2015). Research philosophy has a fundamental role within every research studies. It influences the design besides including the assumptions by which the authors show the way they view the world. The above mentioned assumptions underpin the research strategy as well as the methods chosen for answering the research questions (Saunders et al., 2015). Moreover, Saunders et al. (2015) developed “the research onion” framework and based on that we will follow and adapt it to our study.

Due to the influence that research philosophies have on the way the authors think about the research process, for our study we take into account two major ways of thinking, namely: ontology and epistemology (Saunders et al., 2015). Ontology is defined as the philosophy of how reality and existence is perceived (Easterby-Smith et al., 2015). Within ontology there are different views, assuming different truths and natures of reality. These are realism, internal realism, relativism and nominalism.
According to Easterby-Smith et al. (2015), realist ontology stresses that the world is concrete and external, and that science can go further through the observations that have a direct correspondence to the phenomena under study. There is only one reality that can be observed but no influenced. The authors continue with the second view related to the previous one, internal realism, in which presumes that there is only one reality, however researchers can only have access indirectly through the collection of evidences in the form of data, in order to obtain an approximation of the phenomena studied. The third point of view is known as relativism, stating that there is not only one single reality or truth, however the truth is a creation of humans, dependent of the different views of the researchers. (Easterby-Smith et al., 2015). Finally, the last view of ontology is nominalism, that states that reality is a construct of humans through language and discourse, therefore truth doesn’t exist. People try to create different versions of truth. Taking into account the previously mentioned ontologies and in the best interest of our study, we have decided to choose a relativist ontology. The goal of this study is to get an insight of how the current textile waste management system is performing regarding the future targets and how the different actors involved in the system will be affected. Therefore, every actor has a different perspective depending on the degree of
involvement, making a perfect match with relativism. No single reality exists; many truths exist since is a creation of different perspectives.

The second dimension of thinking is epistemology. Easterby-Smith et al. (2015) define it as “the study of the nature of knowledge and ways of enquiring into physical and social worlds…The study of theories of knowledge; how we know what we know”. Two contradictory positions within epistemology are positivism and social constructionism. Each one has contradictory thoughts regarding the other, being positivism the one that states the social world exist externally (there is one truth) and can be measured through objective methods instead of being inferred through subjective methods such as intuitions (Easterby-Smith et al., 2015). On the other hand, social constructionism has “the view that reality is not objective and exterior but is socially constructed and is given meaning by people in their daily interactions with others” (Easterby-Smith et al., 2015). For social constructionism reality is determined by people’s experiences and the way they experience the world rather than external factors.

As we mentioned above, we have chosen to follow a relativist ontology where it is assumed that not only one reality exists, being the creation of different perspectives. Therefore, in accordance with the statement that not only one truth exists, for this study we chose to follow a social constructionism epistemology. Through interviewing the different actors involved in the textile waste management system, the different experiences of these people will create a holistic reality. Ontology and Epistemology are “ways of inquiring into the nature of the world and assumptions about reality” (Easterby-Smith et al., 2015). For the purpose of this thesis, the ontology and epistemology selected are relativism and social constructionism. These two points of view are intertwined, sharing the belief that not only one reality exists as well as that the reality is composed of different points of view.

3.2 Research Approach

After determining the research philosophy of our study, the next step is about deciding which approach we will choose. It has a significant importance due to the fact that the approach influences and changes the design of the whole research (Saunders et al., 2015). There are three different research approaches, namely deductive, inductive and abductive.
The deductive approach is used when the main goal is to test and validate existing theory. It involves the collection of data, formulation of hypotheses and the final testing of the hypotheses. The inductive approach is used when data is gathered in order to generate theoretical frameworks or new theories through the themes and patterns identified in the data (Saunders et al., 2015) while the abductive approach is a combination of deductive and inductive approaches. In an abductive approach, the aim of the researcher is to discover new things such as other variables and relationships. The main concern will be to generate new concepts and develop theoretical models.

In the best interest of our study, we follow an inductive approach due to its characteristics that make it more suitable. We will collect the data in the first place, to continue with the identification of patterns and themes in order to generate new theories and development of a framework about the phenomena studied. Likewise, a deductive approach would not match our research since no prior theory is developed and therefore cannot be tested (Saunders et al., 2015).

The method used to analyse the data is another choice researchers must take. As Saunders et al. (2015) stated, mono methods or multiple methods might be chosen for it. Within the mono methods, the researchers use only one technique, being either qualitative or quantitative. On the contrary, multiple methods include the use of more than one method. The quantitative approach is basically focused on research based on numerical data, where variables might be measured and conclusions can be drawn from. On the other hand, the qualitative approach is related with non-numerical data, the conclusions are obtained through words and communication (Saunders et al., 2015). In this thesis, we will adopt the qualitative approach. The collection of data will be mainly interviews although secondary sources or observations might be included as well. A quantitative approach has been discarded because it does not match the requirements that our study has. A deeper knowledge of the textile waste management system is needed and therefore, through a qualitative approach with interviews, the research questions will be addressed in a better way. Consequently, based on the above mentioned reasons, this thesis will adopt an inductive and qualitative approach. In the same way, the research philosophy matches with the approach selected. We decided to follow a relativist ontology and a social constructionism epistemology, where there is more than one reality and this truth is
created through human experiences and communications. Through the interviews, the principal actors involved in the textile waste system will share their different realities and points of view that will allow us to develop and understand the reality.

3.3 Research Method

According to Easterby-Smith (2015), a research design is a description by the researchers which explains and supports what, how and from where the data will be collected, often prior the collection has started. In addition, it is also stated in the research design how the researchers will analyze the data and how it will enable them to answers their research questions.

Saunders et al. (2009) declared that the way the research question(s) are formulated will result either in a descriptive, explanatory or exploratory study. Descriptive researches intend « to portray an accurate profile of persons, events or situations » (Robson, 2002) and therefore is essential to have a clear picture of the phenomena before collecting the data. Explanatory researches are studies that establish causal relationships between variables, in which the attention is given on studying a situation or a problem in order to explain that particular relationships between the variables (Saunders et al., 2009). And finally, an exploratory study helps to find out « what is happening; to seek new insights; to ask questions and to assess phenomena in a new light » (Robson, 2002). One of its advantage is the flexibility and adaptation to change (Saunders et al., 2009). Another point Robson (2002) mentioned is the purpose of the enquiry may change over time. Correspondingly, this study follows is of an exploratory nature as we want to know what is happening in the waste management system on the municipality, assess how the textile waste is managed in order to come up with new ideas for enhanced outcomes of that system.

3.2.1 Research Strategy

The choice of the research strategy is directed by the research question(s) and objectives, the extent of current knowledge, the timeframe and other resources available and the researchers’ philosophical grounds (Saunders et al., 2009). There are different strategies
that researchers might consider for their study, that is: experiment, survey, case study, action research, grounded theory, ethnography and archival research. The one we chose for our study on how the current system of Jönköping municipality is managing textile waste is the Case Study. Robson (2002) defined the case study as «a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence». As Yin (2003) expressed, the case study strategy enables to generate answers to the «why» and «how» questions. For this reason, this strategy is often used in explanatory and exploratory research as it is the case for our study.

Moreover, the case study is appropriated when the researchers want to acquire an extensive comprehension of the context being studied and which processes are being performed (Morris and Wood, 1991). Additionally, Yin (2003) explained that there are four strategies within the case study strategy based upon two dimensions: the single case or the multiple case design, and then both can be classified into a holistic case, meaning a single unit of analysis, or an embedded case, which corresponds to multiple units of analysis.

![Figure 8: Types of Case Study Designs, adapted from Robert Yin (2003)](image)

Therefore, our research agrees with the embedded single case design for several reasons. As Yin (2003) stated, you may choose a single case «because it is typical or because it
provides you with an opportunity to observe and analyse a phenomenon that few have considered before » or a multiple case which puts the focus on figuring out if the findings of the first case studied happens in other cases, and thus generalise them. This will not be the case here, due to time constraints we will focus solely on one case, that is the textile waste management system of the municipality of Jönköping. Moreover, as we will study multiple units, that is the different actors performing within the single case, this will be an embedded case study.

In addition, we can distinguish two time horizons in a research, cross-sectional and longitudinal. The cross-sectional research is the study of a particular phenomenon at a particular time. Longitudinal studies are particularly efficient to study changes and developments over time. A basic question answered by longitudinal studies is « Has there been any change over a period of time? » (Bouma and Atkinson, 1995). However, due to time constraints, it will not be possible to study our case over a period of time to examine changes and thus the time horizons of exploration is cross-sectional.

3.2.2 Data Collection

There are several kinds data collection techniques according to if you are doing a quantitative or qualitative research. Quantitative is mostly used as a synonym for any data collection technique or data analysis procedure that yields numerical data. Conversely, qualitative is mainly used as an analogue of any data collection technique, such as interviews, or data analysis procedure that generates non-numerical data (Saunders et al., 2009). This will be the case in our research. Also, a multi-method will be employed to collect the data as in-depth interviews and observations will be performed, and analyzed with a qualitative data analysis procedure. Multi-method means that several data collection techniques are used, but restricted to either a qualitative or quantitative view according to your type of research, and analyse it using their respective qualitative or quantitative procedures, but not mixing both (Tashakkori and Teddlie, 2003).

A concern regarding the collection of the data is about the confidentiality and the anonymity of the organisation or the participant(s) interviewed (Saunders et al., 2009). To overcome this matter, clear assurances were provided prior to any interviews about these elements. The data will not be shared with anyone without the consent of the
3.2.2.1 Primary Data

The first method used to conduct our research was through interviews. As described by Kahn and Cannell (1957), an interview is a purposeful discussion between two or more people. It is used to help researchers to gather valid and reliable data that are relevant for their study.

Saunders et al. (2009) mentioned several types of interviews. They may be very formalised and structured by using standardised questions for each interviewee or be more informal via unstructured conversations. Therefore, they can be categorised into three types: structured, semi-structured and unstructured or in-depth interviews.

Structured interviews adopt questionnaires based on predetermined set of questions and are usually used in quantitative research to collect data that is quantifiable. Semi-structured and unstructured interviews are not standardised and are more commonly used in qualitative research. In semi-structured interviews, a list of themes and questions lead the interviews but are open to dig in what the interviewees say by asking additional questions. Finally, unstructured interviews are rather informal. These are more used these to explore thoroughly a general area in which the researchers are interested. No predetermined list of questions are prepared. This type of interviews can be characterized as informant interviews since it is the respondent who is leading and guiding the interview (Saunders et al., 2009). In order to answer the research questions and fulfill the purpose of our study, semi-structured interviews were performed, as we prepared a list of questions to be covered but we were also open to explore additional information discussed by the respondents. This type of interview also provides an opportunity to interrogate the answers of the participants where they explain or build on their responses (Saunders et al., 2009).

In addition, we also conducted observations in a recycling facility in Jönköping and a sorting facility in Huskvarna as complete observer. Participant observation is an opportunity to get an insight on “what is going on” (Saunders et al., 2009). Gill and Johnson (2002) mentioned four types of observation according to the role of the observer(s) can embrace, namely complete participant, complete observer, observer as
participant and participant as observer. In this study, we adopted the role of complete observer as we did not reveal the purpose of our research to those we were observing and did not take part in the activities. For example, at the recycling centre, we observed the flow of the site, the layout and the placement of the different containers, what actions were taken by citizens that came to dispose of their waste, their behaviour and more importantly how often textile waste was discarded during the observing time.

3.2.2.2 Secondary Data
Saunders et al. (2009) describe secondary data as “data that have already been collected for other purposes” and can be useful to answer fully or a part of the research questions. It includes raw data, which is data that was barely processed, as well as summaries that were published such as reports, company minutes, etc, which received more selection before their publication or was summarised (Kervin, 1999). Using secondary data requires fewer resource requirements, particularly in time and money (ibid.). Moreover, it is less obtrusive and can also be of higher quality than data that we could have obtained on our own (Stewart and Kamins, 1993). Secondary data also provides the ability to compare with the data we have collected and can lead to new information that we have not thought of initially. In this regard, we examined diverse published reports such as from the Nordic Council of Ministers, the Swedish Environmental Protection Agency, etc.

Information from the Internet was also included in the study, and we also visited websites of the organizations part of the textile waste management system of the municipality to get an insight of their activities and information prior to interviews. We looked at their websites from a consumer’s view, as providing information to citizens is an important aspect of the textile waste system since they are the first tier of the reverse logistics processes.

3.2.2.3 Sampling
Saunders et al. (2009) described two sampling techniques, probability or representative sampling and non-probability or judgemental sampling. On the one hand, probability sampling means that all potential cases have equal chances to be selected and is known in advance. Thus, it is rather used for surveys and experimental research strategies when
making inferences are needed from the sample about a population. On the other hand, non-probability samples signify that the probability of cases being selected is not known and can accordingly be chosen regarding their best suit for the research purpose or research questions. Samples can be selected based on our personal judgement (Saunders et al., 2009). Therefore, we used the non-probability sampling strategy.

Moreover, among the non-probability sampling, the judgemental or also called purposive sampling is adopted as it allows us to select the respondents that best enable us to answer our research questions. Also, as in Jönköping municipality a few actors operate, we have a clear picture of who we want to get the information from according to the purpose of our study (Easterby-Smith, 2015). Neumann (2005) declared that this sample’s form is rather used in case study research when samples are small and when there is a wish from the researchers to select cases that are very informative. Afterwards, we approached the different actors and their members in order to know whether they meet the criteria and are available to participate in our research.

In addition, we used a snowball sampling, when contacting companies and members who were eligible, we then asked if they could name or redirect us to other people who could meet our criteria. As Easterby-Smith (2015), this sampling method is useful when eligible members are rare or when it is hard to know which ones can be part of the population.

The size of the sample is dependent on the research questions established and objectives, especially what “needs to be found out, what will be useful, what will have credibility and what can be done within your available resources” (Patton, 2002). Saunders et al. (2009) declared that the data collected from a fewer number of cases denotes that the collection of the information is more detailed. In accordance, we interviewed the actors of the waste management system of textile, namely company in charge of the collection, June Avfall and Miljö through in-person interviews and the major association in the municipality collecting the used textile, Human Bridge via an email interview, as the respondent was not able to meet us but was still willing to answers our questions. An in-person interview would have been preferable, but we believe that the interviewees’ responses by email were sufficient to have an understanding of Human Bridge’s activities in Jönköping municipality and help us to answer our research questions.
Also, along with the observation carried out at the recycling centre, we interviewed consumers sorting their waste in order to have a general appreciation of their consumption habits concerning clothes, how they disposed of them and their opinion about the recycling system currently in place. Consumers are important, being the first suppliers of inputs in the system, their comment about the waste system and more especially the accessibility of disposal for them is a crucial point in this study. Therefore, we interviewed a few of them which we think is sufficient to make a generalization for the whole population and draw conclusions from their comments.

<table>
<thead>
<tr>
<th>Interview Number</th>
<th>Respondent Name</th>
<th>Type</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Produktionchef at June Avfall &amp; Miljö</td>
<td>Face-to-face</td>
<td>13/04/18</td>
<td>120min</td>
</tr>
<tr>
<td>2</td>
<td>Recycling Centre</td>
<td>Guided visit + Observation</td>
<td>17/05/18</td>
<td>90min</td>
</tr>
<tr>
<td>3</td>
<td>Human Bridge</td>
<td>Email interview</td>
<td>16/04/18</td>
<td>/</td>
</tr>
<tr>
<td>4</td>
<td>Sorting Facility</td>
<td>Guided visit + Conversation</td>
<td>18/05/18</td>
<td>90min</td>
</tr>
<tr>
<td>5</td>
<td>Consumers C1</td>
<td>Face-to-face</td>
<td>15/05/18</td>
<td>30min</td>
</tr>
<tr>
<td>6</td>
<td>Consumers C2</td>
<td>Face-to-face</td>
<td>16/05/18</td>
<td>25min</td>
</tr>
<tr>
<td>7</td>
<td>Consumers C3</td>
<td>Face-to-face</td>
<td>16/05/18</td>
<td>22min</td>
</tr>
<tr>
<td>8</td>
<td>Consumers C4</td>
<td>Face-to-face</td>
<td>16/05/18</td>
<td>27min</td>
</tr>
<tr>
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<td>Face-to-face</td>
<td>16/05/18</td>
<td>29min</td>
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<td>Face-to-face</td>
<td>16/05/18</td>
<td>27min</td>
</tr>
<tr>
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<tr>
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<td>Consumers C10</td>
<td>Face-to-face</td>
<td>18/05/18</td>
<td>25min</td>
</tr>
</tbody>
</table>

*Table 1: Interviews overview*

3.2.3 Data Analysis

Saunders et al. (2009) mentioned that during the step of data analysis probably occurs the greatest “danger” of “logic leaps and false assumptions” as the researchers will have to move from a position where they have lots of data to analyse, to one where they have to come up with conclusions that are consistent. Easterby-Smith et al. (2015) affirmed that a common issue faced by researchers is about how to abridge the considerable, complex and contextual information into a credible summary.
In this study, only qualitative data has been collected and will therefore be analysed. Qualitative data is data that is non-numeric or that have not been quantified (Saunders et al., 2009). When collecting the data through an interview, we recorded the participant and afterwards transcribed it using the actual words said. In the transcript, our questions were included to facilitate the analysis in order to avoid a misinterpretation of which question the respondent was answering. Before analyzing the data, they have to be organized (Easterby-Smith et al., 2015). As we were following an inductive approach, we started to collect the data and then explored it to see which themes to pursue and focus on. There are several types of qualitative analysis processes according to Saunders et al. (2009) – summarising, categorisation and structuring of meanings. We chose to categorize the data into groups by first developing categories and second assigning the categories pieces of data relevant to it. It allowed us to recognize relationships and develop them further (ibid.). As the amount of data can be considerable, it makes the data more convenient to analyse.

After that we followed a thematic analysis. A thematic analysis is one of the most common approaches when analysing qualitative data due to its flexibility and ability to be used in many contexts (Bryman, 2012). The strategy used to assist this type of analysis is to employ a framework. A framework is characterized by a “matrix based method for ordering and synthesizing data” (Ritchie et al., 2003). The main themes and sub-themes are excerpted from the data and represented in a matrix by reading and re-reading the transcripts. Bryman (2012) described a theme when following four aspects. First, it has to be a category identified in the data. Second, it relates to the research focus and likely in the research questions. Third, it builds on codes from the transcripts and finally it gives a basis for the researchers to understand theoretically their data collected. Then, the framework is applied to the data which are classified into main themes, and these are divided into sub-themes, as display in the Figure 3.4.
Main Theme 1

<table>
<thead>
<tr>
<th>Sub-Theme</th>
<th>Sub-Theme</th>
<th>Sub-Theme</th>
<th>Sub-Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interview 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interview 2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table 2: Example of Matrix to assist a Thematic analysis, adapted from Bryman (2012)*

For the email interview with Human Bridge, the data was already in a textual form. However, we are aware that email interviews provide less information than face-to-face interview but we believe that the information provided was sufficient to help us in our research. As stated by Yin (2003), a researcher can make a good case study by never leaving the library and the phone.

### 3.5 Research Quality

On every research performed, there is the rising question of credibility of the research findings. This has been expressed by Raimond (1993) with the "How do I know?" question regarding the quality of the interpretation of the data and the conclusions made from it by the researchers. Therefore, this is of high importance to emphasize on three aspects in the research design to be able to reduce as much as possible the risk of bias in the analysis of the data: reliability, validity and generalizability.

#### 3.5.1 Reliability

Reliability is "the extent to which your data collection techniques or analysis procedures will yield consistent findings". It can be evaluated by determining if the results found can lead to similar results on alternative attempts, if other observers come up with identical observations and if there is transparency in how sense was made from the data (Easterby-Smith et al., 2008). Yin (2003) and Silverman (2007) also expressed that reliability in qualitative research is related to whether other researchers would come up with identical information by following the exact the same procedures by previous investigators and conducting the same case study all over again. The objective of reliability is to minimize errors and biases in a study (Yin, 2003).
Robson (2002) identified that there may be four threats to reliability, namely participant error, participant bias, observer error and observer bias. Regarding participant error, the pre-arranged meetings were decided by the respondents and were thus made at a convenient time for them to avoid bad mood or stress. Participant bias was tackled by providing them the right to be anonym, so they could express themselves freely without worrying about potential future consequences. Observer error was lessened by introducing a structure to our interviews and the questions were asked by both co-authors and finally observer bias was limited through a conjoint analysis and judgment to involve different views.

3.5.2 Validity

Validity is important to know whether the findings are really about what they appear to be about (Saunders et al., 2009). It refers to « the extent to which the researcher gains access to their participants’ knowledge and experience, and is able to infer a meaning that the participant intended from the language that was used by this person » (ibid.). When conducting a qualitative research, Stemler (2001) asserted that validity is achieved via triangulation, which gives credibility to the findings by including several sources of data, researchers, theories or methods. In this regards, we incorporated in our study different sources of data, as multiplying theories or methods would have not provided an enhanced quality of our case in our opinion.

3.5.3 Generalisability

Generalisability is an issue that can potentially arise in the design of the study to realize to which extent the results found in your research are generalisable. In another words, researchers have to assess if their empirical findings can be evenly applicable to other research settings or not (Saunders et al., 2009). Most articles in the literature described case study generalization as « an effort to generalize from a small number of cases to a larger population of cases » (Byrne, 2013; Ragin, 2009; Seawright and Gerring, 2008; and Woolcock, 2013; Yin, 2013).

Bennett (2004) asserted that the ideal generalisation can be applied to many other types of cases. Regarding the fact that each municipality in Sweden is considered as a case
because they all have their own way of managing textile waste, and the future legislation will be applied to all municipalities in Sweden, we believe that our findings can be generalized to other cases. In addition to these three aspects, Easterby-Smith et al. (2015) mentioned that seminars which allow researchers to present their work in-progress in order to get different viewpoints is a good opportunity to improve the quality of the study.

3.6 Research Ethics

In the context of research, ethics refers to « the appropriateness of your behaviour in relation to the rights of those who become the subject of your work, or are affected by it » (Saunders et al., 2009). Cooper and Schindler (2008) defined ethics as the « norms or standards of behaviour that guide moral choices about our behaviour and our relationships with others ». The overall ethical issue concerns the research design which should not affect the interviewees (or the research population depending on how you decided to collect the data) to embarrassment, harm or any unethical practices. In another words, research ethics relates to questions about how the research topic is formulated and clarified, how is the research designed and how access has been gained, how data has been collected, processed, stored and analysed, and the research findings reported in a moral and responsible way (Saunders et al., 2009).

Saunders et al. (2009) also added that within business and management research, two different philosophical beliefs dominate: Deontology and Teleology. The deontological point of view suggests that whatsoever the purpose of the research, it can not support the use of research carried out under unethical behaviour. In this regard, if researchers adopt this view, no aspects such as deception to obtain the research data should be done, even though it was necessary to guarantee the validity and reliability of the data. At the contrary, the teleological belief supports that « the ends served by your research justify the means ». As a consequence, researchers have to assess if the benefits of the research outweigh the ‘costs’ of acting in an unethical manner as well as considering if the benefits brought about by their study are morally fair. For our study, we adopted the first philosophical standpoint, namely deontology, as we are of the opinion that the ends served by our research are beneficial for the municipality and the environment, but does not justify any deception or threat which will be in contradiction with our values or the ones
taught at the university.

We also respected several essential issues that arise during a research project. We respected the privacy and anonymity of the participants by no divulging their names, addresses or any other personal information, if they wanted so. Therefore, their participation was of course asked and was thus of a voluntary nature with the right to withdraw partially or totally from the study. In addition, no deception, threat or harm were made and the confidentiality of the data maintained all along the process. Also, the participants were informed about the purpose of our research and how we intended to process the data collected, with the assurance of no leakage of information that could be sensitive. Finally, during the analysis and reporting processes, we tried to stay objective and avoid bias in order to be able to analyse and report not in a defective way.
4. Empirical Findings

In this section, we present the empirical findings through both primary and secondary data. First, the findings of the interview with the waste management company are outlined, followed by the charity organization collecting the textile. A description of the observations made at the sorting facility owned by Human Bridge as well as in a recycling centre owned by the municipality is presented. Then, we reported secondary data about FTI and finally interviews with consumers are also summarized.

4.1 June Avfall & Miljö

June Avfall och Miljö AB is a company owned by Jönköping municipality at 95%, Mullsjö municipality 2% and Habo 3%. The company is in charge of the garbage collection and operates recycling centres in the three municipalities.

There are about 60 people working for the collection of the garbage, 50 drivers and 10 people planning. One person is specifically in charge of planning the routes for the drivers and another for the daily “problems” such as when a truck breaks down or when someone gets sick for instance. A problem encountered by the company is to find drivers, as they are currently lacking 15 drivers. Normally, the collection works as follow: one person drives the truck and another pick up the waste behind. Both of them are considered as drivers as they have to be able the drive the truck.

Due to the new law, since the beginning of this year 2018, every citizen should have the opportunity to separate the food. To do so, every citizen can get two bins for sorting their garbage depending on the subscription they chose. There are three different rates for the collection of the waste whether a citizen lives in a house, apartment blocks or summer cottage. It includes a flat fee which consists of getting access to the recycling centres and administration plus a variable fee for the cost of collection and treatment of the consumer’s waste. Citizens can choose to subscribe to the “Immediate Collection Packaging (FNI)” where they will receive two vessels to sort directly from their home packaging, newspapers, food waste and residual waste. In exchange of this effort, they
get a cheapest rate for their waste collection. On average, every citizen has to pay between 2000 and 3000 SEK per year for the collection of their waste.

To collect the waste, two different trucks are used, one for food, paper, and the rest of the garbage, and another one for metal, newspapers, glass, paper bags and similar waste. Regarding the frequency of the collection, Respondent 1 said:

...“We collect the waste every week for buildings with more than two apartments, and once every two weeks for every villas or bungalows. On pair weeks 2,4,6,8... we collect one side, and impair weeks 1,3,5,7, ... we collect the other side of the streets, so in that way we got a two weeks’ cycle” [R1]

The company owns 30 trucks to collect the waste. One truck costs approximately one million SEK. As a result, small municipalities cannot afford those trucks.

Also, near residential areas, 5 cubic inches’ bins are placed where people can dispose of their food or other waste such as textile… while close to small groups of houses, normal size bins are placed.

The company collaborates with FTI, where its drivers collect “… small bins, metal bins, paper, plastic, ...” in which FTI pays a fee according to the weight collected. Then, they are transported to recycling centres where the trucks are weighted several times as there are different materials. FTI has many recycling stations spread all over the city, in order to make easier for citizens to dispose of and sort the material waste which falls under producer responsibility, such as glass, plastic, newspapers and so on, as otherwise they would not take the time to throw them away properly. R1 also mentioned that those stations are often dirty, which does not necessarily make citizens motivated to sort correctly the waste.

In addition, consumers can order the collection for bulky items that they cannot put in their car to bring it to the recycling centre, or for example people that are too old or invalid, in exchange of an extra cost.
R1 specified that in Sweden, waste is not disposed to landfill anymore, rather in energy recovery when it has not been possible to follow the previous steps of the waste hierarchy (reuse or recycling). When the collection is done directly at people’s houses, everything is converted into biogas except if they have bags where they put plastic, paper or glass, which are recycled at different areas in Sweden.

Moreover, in “wealthier” areas, R1 noticed that there is more garbage than in “poorer” areas. Students and immigrants’ areas are the worse ones regarding the sorting. In his opinion, it is mainly due to the fact that the instructions given are only available in Swedish, and not in other languages which results in garbage disposed not in the right bins. The respondent suggested thus to write instructions in different languages and could make better pictures of what to put or not to put in.

Furthermore, the company is trying to improve the information given to citizens through their webpage and facilitate the services offered to them, as according to Respondent 1 “the system is not so modern”.

As a result, it is in the process to inform citizens in a better manner through their webpage and by the help of the new system, where they will get their log-in in order to know what date will be the next collection, see their bills, their complaints, be able to change the bins and order new ones, and so on. That will be an upcoming project in the four or five years.

For three years now, the company has been using a GPS system which allows to track the trucks collecting the garbage, sees where they are, which speed they are driving at, where they are standing, which areas have been cleared out and which bins are still to be done, using green and red dots in their map in real-time. The system also shows the percentage done during the day by the drivers and the percentage still due. All drivers have a computer in the trucks that also informs them when they have emptied a bin with a dot turning green and which ones are remaining. If there is a problem or if a driver cannot make it by emptying all the bins he should be, the employees in the office can call another driver in the same area for assistance which permits to empty the whole area. For remote areas, “in the middle of nowhere” as expressed by R1, four trucks are allotted, but in these
ones, there is no connection between them and the office as there is no computer inside them.

One person is currently in charge to enter and make the different routes into a new IT system, as they are still made manually, which takes a lot of time. As a result, most of the routes for collecting the bins have been the same for almost 25 years, and no or minor improvements were made since. The planning of the collection is very complex, as sometimes there can be several trucks in the same streets as they are collecting different kinds of materials and bins. Taking that into consideration while making the routes can result in tremendous amount of different combinations.

This new system, which is different from the one to track the drivers, will allow to take into consideration how long the drivers work, how much can a truck load in quantity, how many bins, and so on, and the system carries out the analysis and comes up with the best routes possible for every drivers and areas. That system is expected to be put in place in Jönköping municipality for May 2018. However, the problem of the area of Jönköping is the extent of it which makes it harder to implement changes as it can easily result in much longer time for the collection if the changes in the routes were not good.

The routes for each driver are planned to be made on the six-hour-work, as they work eight hours per day and they have to go to recycling centres to dispose of the collected waste, fill the truck with fuel, etc. That information has to be put into the new system.

After the implementation in Jönköping municipality, it will be implemented as well in Habo and Mullsjö. The goal is to reduce the number drivers have to drive between each bins. The shorter they have to drive, the better it is. As R1 stated:

…”In our world, we measure efficiency by how many meters they are driving to each bin”. [R1]

At the end of the day, the drivers go either to Torsvik to dispose of the food waste and the other kinds of garbage or Tenhult for the packaging waste. To dispose of the food waste, June Avfall & Miljö has to pay a fee to Jönköping Energy. So a municipality owned
company (June AB) has to pay another municipality owned company (Jönköping Energy) to dispose of food waste, and in return Jönköping Energy makes biogas that they sell to June AB.

Also, R1 conveyed that he got a better experience, when travelling to Paris or Barcelona, about the cleanliness and the easier system of the placement of bins in parking lots, which doesn’t cost more money nor to make new buildings, as in Jönköping workers for June Avfall & Miljö have to go fetch the garbage bins directly into the buildings.

Regarding textile material, the municipality also collaborates with Human Bridge to collect the used garments, in the sense that the association is allowed to place their containers, generally near FTI recycling stations or in recycling centres for example. However, those bins are small compared to the ones for other materials and those have only been placed in recycling centres for one or two years. R1 stated that most used textile either end up in the garbage, or a small part in the recycling centres:

…the normal stuff, is people put it in the garbage. Or maybe not when you are cleaning out your wardrobe once every 10 years.”

…I think that’s the biggest problem we have with the environment, that we don’t buy good stuff.”

…“it’s the same harm on the environment to buy cheap shirts as expensive ones so… I think that’s where you should put your energy. ” [R1]

Accordingly, R1 recommended to buy clothes of better quality if the finances of consumers allow it.

4.2 Human Bridge

Human Bridge is an organization created in 2001 which is specialized in the supply of medical equipment. Its main office and head warehouse are located in Holsbybrunn, Sweden, and possesses also several warehouses and sorting centres from Stockholm down to Lund. There are more than 60 permanent employees, and more than 100 volunteers.
The organization is considered as an NGO in Ethiopia since 2011 and implement about 30 projects in different countries per year.

Its main activity is to send used medical materials to countries in need around the world through contacts with Swedish hospital and biomedical institutions. After collecting them, the organization repairs and distributes the medical supplies to those countries, mainly in Africa or Eastern Europe.

Its goal is to implement development, relief and social projects on behalf of Swedish partners and in receiving countries. To do so, they collect and repair all types of medical equipment and supplies before shipping them to hospitals in other countries, purchase and ship supplies such as food, tents or blankets to areas where the disaster occurred. In addition, they also collect, sort, pack and ship clothes to the people in need and raise funds to cover the costs of different projects.

Apart from its main activity, Human Bridge collects about 8 000 tons per year of used textile (clothes, shoes, accessories and home textile) and work in collaboration with municipalities such as in Jönköping which allow the organization to place its containers around the city. Most of them are placed near FTI's recycling stations due to the proximity to consumers where they collect it themselves. Moreover, Human Bridge collaborates with Läkarmissionen and Erikshjälpen and get excess materials from stores such as the sport chain Stadium. Below is a picture of a textile bin.
After the collection, depending on the quality of the inputs from citizens, used textile are processed in different manners. They are either exported to international companies in Europe for selling without any prior sorting, sorted in Sweden before being sold in Lindra second hand for textile which remains in good quality or shipped to Africa, Eastern Europe and Middle East to their receivers for apparels that are in poorer condition. All the surplus got from the selling of textile goes to aid work though the delivery of clothes or preparing and delivering medical equipment. Textile that are in bad condition, such as containing holes or being dirty go to recycling. Only a tiny percentage go to recycling from Human Bridge’s sorting facilities.

They have sorting amenities in Holsbybrunn as we mentioned before which is the main one, but also in Högsby, Ullared, Vallentuna and Huskvarna, which is the sorting centre used for the textile collected in Jönköping municipality. Unfortunately, we were not able to visit this facility. In addition, they have four more warehouses, two in the area of Stockholm (Rosersberg and beside Globen), Gothenburg (Âbro) and Genarp (Lund). Also, on their website, there is a link which display to web visitors how much water they can save or have saved by giving their old clothes and shoes in the containers.
Regarding the upcoming law about textile in Sweden, when asking how do you think it will affect your activity and what are your plans against it, Respondent 2 said:

…“As there are still some uncertainties about the new law, we will wait until all the details are clear before we can form an opinion about how it will affect us. We cannot speculate around the volume.” [R2]

Lastly, Human Bridge is an organization member of the Svensk Insamlings Kontroll (Swedish Collection Control), which is an association whose purpose is to ensure that “public collections for humanitarian, charitable, cultural and other public purposes are carefully controlled, that collections are not exposed to irrational costs, that proper methods of marketing are used in line with the collection process and that relevant methods of collection are developed”.

This association provides information about organizations which are part of the “90-account” in the interest of the donors, as there are no legal rules in Sweden that determine how to collect money from public collections. The 90-account is a quality stamp that proves whether collecting organizations are serious. It is a seven-digit bankgiro and PlusGiro account, which begins with 90. Only the organization that meets the high standards set by the Swedish Collection Control can be granted a 90-account. Therefore, having the logo “90 account” is a sign of thrustworthiness for organizations and trust for the donors, which ensures that the collection has been conducted ethically and responsibly with the collected money used for their purpose without irrational costs.

4.3 Sorting facility of Human Bridge in Huskvarna

All the textile collected from the bins of Human Bridge in Jönköping municipality goes to the sorting facility in Huskvarna. We had the chance to have a guided visit of their sorting facility in order to have an understanding on how they are collecting and sorting the garments. Human Bridge possesses 2 trucks, one large and one small. The big truck usually goes to recycling centres. In Jönköping, the charity has about 85 bins dedicated to textile and the pick-up is organized as follow: 3 times a week for the most populated areas while for other areas it is once a week. Thus, the containers do not need to reach full load to be emptied. Also, the charity organization hires people in social difficulties
and trained them to sort the textile in the facility, even for those who do not speak Swedish as it is quite easy to learn how to differentiate the quality of the clothes according to the manager of the facility. About a hundred people in total are working for the charity.

When the sorting amenity in Huskvarna receives more textile than they can handle, they are sent to the bigger sorting facility in Holsbybrunn which is twice as big for further inspection and sorting. As one the people who gave us the tour expressed:

... “we collect 13 to 14 tons of garments each week.” [R4]

However, people are not always exemplary at sorting and disposing,

... “We also found in containers plastics, glass, porcelain and other materials that should not be here.” [R4]

If the amount of clothes is still too large for them to manage with no place to store it at that facility, they are sent to Lithuania to be given to another charity without any prior sorting in Sweden.

The textile is inspected and sorted depending on their remaining quality. Clothes without any holes or look in good condition are meant to be sold in second hand stores such as Lindra or Erikshjälpen, the others go either to Lithuania or to recycling.

... “About 10% of the apparels we receive are considered as high quality and thus can be resold, 75% is exported to Lithuania and 15% to recycling.” [R4]

Apparels are sorted depending on the season, summer and winter, and put in different colour bags, green for summer with the mention “light” and red for winter with the mention “warm”. Shoes are also separated and put to different bags as well as accessories and home textile. The facility is equipped with humidifiers to avoid dust on the clothes and not deteriorate them further. After the inspection and sorting into different bags, all of them are compressed in order to save space before sending them to their destination.
In total, plastics bags where garments are put into account for 4.5 tons at the end of the year, which are sent to Nörrköping to be recycled so we can have an idea of the amount of clothes they receive and handle, solely from the area around.

4.4 Recycling Centre

In Jönköping municipality there are 9 recycling centres and we had a guided visit and performed an observation at the one located in Returnvägen, near Råslätt. This recycling centre is the newest and also biggest in the municipality. All of them belong to the municipality owned company June Avfall & Miljö and provide citizens a convenience to discard and sort a wide range of waste that are either in too large quantity or not allowed to dispose in their home garbage, such as electronics, woods, garden waste, hazardous waste, metal, glass, and so on. There is also a “Pant” machine where people can decide to have their money back or instead give it to a charity. From that machine Respondent 2 mentioned that quite a lot of money goes to charities.

The disposal in recycling centres is “free of charge” in the sense citizens do not have to pay an additional fee to dispose of their waste, yet they pay an annual fee for the collection and treatment of it. When containers for different materials reach full load, trucks from recycling companies other than June Avfall & Miljö collect and transport them to the appropriate location for further processes. When asking if citizens perform the sorting properly at the site, R2 said:

… “Most of the time, it is done in the right way, but we always check the containers to see if there are elements that are not where they should be.” [R3]

Indeed, the layout of the site is rather well done, with clear signs to indicate the incoming cars where to go and with two roads, one road near containers where you can stop and discard your waste and another road on the right to drive where it is not allowed to stop, in order to avoid congestion at the site. Moreover, there are also parking places and clear pictures near each container about what to put in it. Nevertheless, a little drawback we observed is that only Swedish is available, as Respondent 1 declared:
... “They have a policy to only write it in Swedish, it is only in Jönköping I guess. I’m from Malmö and we have a lot of immigrants, and it is also written in Arabic so they can understand.” [R1]

Furthermore, we noticed two containers dedicated to the disposal of used textile for consumers which are owned by Human Bridge, as displayed in the image below. These are much bigger than the other ones located around the city near FTI’s recycling station or residential areas, and you can dispose of whole or torn clothes, all kinds of home textiles, handbags, accessories, whole shoes. However, it is forbidden to discard mattresses, pillows, carpets, wet or dirty textiles, broken shoes, suitcases, plastics and production residues in them.

![Textile containers in Jönköping’s recycling centre.](image)

During our observation time, no textile was disposed in one of the two containers at the service of the citizens. Yet, according to R2, once the containers reach their full capacity Human Bridge’s workers come to the site to collect them with their own vans or trucks. This activity is never performed by the municipality owned company.

In regards to the frequency of cars’ inflow in this recycling centre, Respondent 2 stated:

... “There are 600 cars a day coming here, so it is a lot.” [R3]
4.4 Förpacknings & Tidnings Insamlingen (FTI)

In 1994, the Swedish Government introduced the producer responsibility for packaging and newspapers, meaning that producers are responsible for the impact of the products they manufacture on the environment and their disposal.

FTI is a company appointed by the Swedish Government which works on behalf of the producers who sells their packaged goods and newspapers by collecting the materials in which the Extended Producer Responsibility applies. FTI has five owners which are five materials companies, namely MetallKretsen, Plastkretsen, Pressretur, Returkartong and Svensk Glasåtervinning. All companies are non-profit organizations. FTI’s main office is located in Stockholm.

The materials in the packaging and newspapers collected have to be recycled and utilized to manufacture new products. Therefore, it requires a collection system that should facilitate consumers to dispose of and sort their waste in recycling stations anywhere in the country. There are two kinds of collection systems. Either the recycling stations where consumers dispose of their packaging and newspapers or a real-estate collection, where the property owner signs an agreement with FTI. All recycling stations are on the responsibility of FTI. 5,800 recycling stations are available in Sweden; 42 are located in Jönköping municipality, and most of them are near gas stations, stores or residential areas. In some of them, containers to collect batteries and clothes are also positioned. FTI does not own the land where those recycling stations are, it has to obtain the permission from the municipality or the landowner to build them. They collaborate with the municipality and dialogue about how the collection is performed as well as possible enhancements. Once collected, the waste is transported to facilities where they are sorted and compressed. Afterwards, they are processed in order to be sold to companies that use recycled materials instead in the production of their products.

FTI collaborates with about 200 partners to perform activities such as emptying receptacles, cleaning recycling stations, bales, compressing and transporting the collected waste to recycling amenities and also transforming the used packaging and newspapers into new quality materials. All collected materials are kept separated. These companies
are contracted for three to five years which enables both FTI and them to make trustful relationships and also adapt to the changes that can occur.

Producers are required to pay a fee for the packaging collection and recycling of their materials, as the costs for operating these two processes account for approximately one billion SEK. The fees are based on the weight of the collected packages and differ according to the type of material, however for newspapers the company in charge of collecting and recycling pays all costs.

All the materials collected are sent to recycling facilities to be transformed into new materials. In 2016, the amount of different packaging in kilograms per person in Jönköping municipality collected by FTI is shown in the table below.

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Glass</th>
<th>Cardboard</th>
<th>Plastic</th>
<th>Metal</th>
<th>Newspapers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jönköping</td>
<td>17,15</td>
<td>15,58</td>
<td>7,88</td>
<td>2,05</td>
<td>32,71</td>
</tr>
</tbody>
</table>

*Table 3: Amount of packaging waste disposed of by consumers in Jönköping Municipality in 2016, adapted from Ftiab.se (n.d.).*

Each year, FTI publishes the recycling rates of each material. These are represented in the following table for the year 2016.

<table>
<thead>
<tr>
<th>Material</th>
<th>Recycled rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>92.80%</td>
</tr>
<tr>
<td>Cardboard</td>
<td>80.40%</td>
</tr>
<tr>
<td>Plastic</td>
<td>42.20%</td>
</tr>
<tr>
<td>Metal</td>
<td>77.50%</td>
</tr>
<tr>
<td>Newspapers</td>
<td>95.00%</td>
</tr>
</tbody>
</table>

*Table 4: Recycling rate achieved by FTI for the different packaging under the producer responsibility, adapted from Ftiab.se (n.d.).*
The Swedish Government set higher recycling targets in the outlook of 2020, 90% for glass, 85% for cardboard, 50% for plastic, 85% for metal and 90% for newspapers packaging. Some targets are already reached, others not, such as for cardboard, plastic and metal.

FTI uses an IT system to control the collection by either its own employees or its outsourced partners, where you can see the station ID, its name, address, the date and time when the last collection was performed for each materials and the next planned collection. All that information is available on the website. Citizens can therefore see if a container is full, check the emptying time before going to the recycling station and report a need for cleaning or emptying.

5.6 Consumers

A total number of 10 consumers (citizens of Jönköping) have been interviewed for the purpose of this study. By sharing their different opinion and answers we us, we could get an insight on the viewpoint of consumers affected by Jönköping municipality waste system.

The frequency with which consumers buy clothes varies, offering a range going from the “once every six months” from C8; to the response of C3 “I think I do purchase a lot of clothes, I think 3 times per month”. However, in all of them there is no specific pattern, being mostly random purchases motivated by factors such as changes in trends and replacement of old garments.

… “Usually it is because I need something new or something different... sometimes it is just because I feel like buying new things.” and “Yeah of course I follow different social media channel and also in the street you see people and you think it is nice and want to have it too” [C4]

When it comes to disposing clothes, the main reason for the majority of participants is due to not being up to their standards anymore, mainly because of regular use. C6 stated:
“after using it and washing up clothes lost their original colours and they don’t look good enough” [C6]

Likewise, C2 said:

…“If I own it for a year or more usually that means that the quality is less, since I always buy cheap clothes. It is because it’s not up to my standards anymore” [C2]

The most chosen option to dispose the no-longer-needed clothes is to give it away to charity organizations, although friends and family are usually taken into consideration as possible recipients of them. C3 mentioned:

…“I would see if I can make happy one of my friends, otherwise I would give it to charity” [C3]

The reputation and trust of charity organizations is high and the majority of respondents trust their work as C9 expressed:

…“I really like the job they do, it’s important for me to know that people in need will be helped. In this regard I trust their work” [C9]

The knowledge about what happens after disposing the clothes in the regular trash is assumed but none of them was certain about it, as C10 declared:

…“I don’t really know, i assume that it would be incinerated or maybe thrown into a landfill” [C2]

Regarding the information about recycling that the municipality offers, it is considered as not sufficient:
“I think if you are very interested you would actually have to look for it by yourself because it’s not very clear...If you walk around the city you don’t see anything to where to get rid of your clothes” [C2]

In the same way, there is the belief that recycling could be encouraged if the accessibility of bins would be facilitated, as C5 stated:

… “sure, if I had closer and more recycling bins available, I would feel more motivated. Convenience it’s definitely a key factor i guess” [C5]

When asked about the possible improvements that they could think about in order to get higher rates of recycling, education of citizens about how to recycle and more visibility of the specific bins were suggested many times.

…“So I think people need to get educated on where to bring the clothes that they don’t wanna have.”

“Education of consequences of fast fashion and the advantages of giving to someone else instead of throwing it” [C4]

Similarly, C2 suggested to offer more availability of places where to find the recycling bins such as supermarkets, due to the convenience of them. Also, most of the participants replied positively to the questions about knowing the involvement of retailers in the recycling process, taking back discarded clothes.

Finally, when asked about the main motive to recycle, the principal reasons were related to helping people, being environmentally responsible and giving a second use to clothes that might be still in good conditions, as expressed by C10 and C2:

…“for me the main motive is because is the right thing to do, I mean, reusing the textile discarded by others we can help people at the same time that we contribute to not harm the environment anymore” [C10]
… “why would you throw it away and make it exist anymore? This doesn’t make sense in my opinion” [C2]
This chapter presents the analysis of the findings in relation to the theoretical framework of the second section. First, we provide an overview of the general waste management system in Jönköping municipality. Then, we introduce how textile waste is managed in the municipality and afterwards propose how the current system can be improved from a logistics point of view. Finally, we discuss other non-logistics aspects that can enhance the retrieval of textile waste value.

This study focuses on the problem of the loss of value from the waste of used textile, and how best that value can be retrieved in the current waste management system of Jönköping municipality, in order to reduce the environmental impact of textile material, being in the manufacturing or in the disposal, as well as satisfying the growing demand for raw materials needed in the production from an environmentally-friendlier manner. The system theory introduced in the section 2.1 is applied to analyse the current waste management system of the municipality and determine potential enhancements taking into account the upcoming law which could affect the actors in the system through two possible ways, either committing the ownership of the waste to the producers via EPR or to the municipality.

The following figure 5.1 displays the current waste management system of the municipality embracing the theoretical framework.
As defined in the second section by Haines (1998), to identify if the waste management of Jönköping can be considered as a system, the components have to be interconnected and operate together for the general goal of the whole. In the findings, we found that the municipality owns a company in charge of the collection and disposal, June Avfall & Miljö, and 9 recycling centres. Moreover, the municipality collaborates with FTI for the collection of packaging by allowing them the right to place their containers over the city, and FTI collaborates with June Avfall for their collection, transportation and disposal in the recycling centres owned by the municipality. Human Bridge is an element which takes only part of textile materials by collecting, sorting and either selling for reuse or recycling. The organization also collaborates like FTI with the municipality by being granted permission to place its textile bins to collect them.

As described by Bertalanffy (1972), a system is a number of elements interrelated among themselves and with the environment. Thus, the findings showed that the different elements, being the municipality, June Avfall, recycling centres, FTI and Human Bridge are to a certain extent interrelated to each other, all handling a part of the waste in the municipality and collaborating with each other with the common goal of managing the
waste in totality in the best and most efficient way in order to produce quality outputs. Accordingly, we can safely assume that these elements and their relations among them and the environment are constituting a system, the waste management system of Jönköping municipality.

In the theoretical framework, it was discussed two types of systems, the white box system and the black box system. The white box system lays attention on the actors as well as their interconnections while the black box does not provide any information on the functioning of the processes performing in the system. In the case of this study and analysing the waste management system, the white box system perspective is applied as we aim at studying the different elements contributing to the management of the waste and their relations which will in the end results in the production of outputs. The adding value created by every single actor will produce the aggregate value of the system through its outputs.

When analysing the waste management system, the municipality acts as the controller between the elements that constitute it. These elements operate in different ways within the system. June Avfall & Miljö collects and disposes of household waste, and also packaging that is initially the responsibility of FTI but outsources these activities to them. The 9 recycling centres belonging to the municipality receive the different materials where they are sorted by consumers or employees in order to improve the future recycling processes and finally Human Bridge serves also as a collector, although only for used textile. It is not the only actor acting as a collector of this material in the municipality, since Myrorna, Erikshjälpen and the Red Cross also collect it, nevertheless to a lesser extent as Myrorna has solely 2 bins in the municipality while Erikshjälpen and the Red Cross collect the no longer wanted garments directly at their store when consumers are willing to dispose of them there.

In the end, all types of waste and materials are managed by the elements of the system, some performing a more important work than others. Having explained how the general waste management system works, now we should specifically lay our focus on how the textile waste is managed and answer the research questions lead by the problem and purpose of this study.
5.1 How is the current waste management of Jönköping municipality performing and how is the value retrieved?

Through the collection and interpretation of primary and secondary data, we are now able to explain and illustrate what and how is the flow of post-consumer textile occurring in the municipality and how it is managed, as shown in the figure 5.2.

There are four main actors in the textile waste management system of Jönköping municipality. Households is the first major actor of the system, and as Ezura A. Jalil et al. (2016) mentioned, play a crucial role in assessing whether or not no longer needed clothes will end up in the RL system or disposed as waste. Indeed, Respondent 1 revealed that a large part of the used textile ends up in the trash and not in one of the bins put at the households’ disposal. This is in accordance with IVL Svenska Miljöinstitutet (2015) which stated that Swedish consumers buy on average 12.5 kg of textile per person per year but about 1/5 is collected. Once disposed in the trash, textile is treated like other households’ waste and sent to incineration for energy recovery. Thus, most of the remaining value is lost and actions have to be taken to increase the collection rate.

The main second actor is Human Bridge. The organization collaborates with the municipality in order to be able to positioned its textile bins, usually near FTI recycling stations for the easy accessibility for the households and in the recycling centres. This confirms the declaration of Avfallskaraborg (2016) that collaboration with charities at recycling centres on reuse is developing and becoming more common. Another point about charities is the credibility and transparency that they should provide towards the eyes of the consumers. Indeed, Ekström and Salomonsson (2014) mentioned a lack of trust among Swedish citizens regarding the activities of charitable organizations, stressing the need for a certification or an accreditation of being trustworthy and responsible. When going through the website of Human Bridge as well as the ones of second hand stores present in the municipality, they all have the 90 Konto logo, which indicates consumers and internet users the trustworthiness and serious of these organizations.

The third actor is second hand stores through the collection of clothes and other used garments directly from their physical store located in the city. However, they represent a
small part of the total of used textile flow since the most common way for the households
to dispose of their apparels is through their home garbage or via a Human Bridge bin,
which “covers” more areas through a larger number of textile bins and thus receives more
textile. The value through this reverse channel is maintained as its maximum according
to the waste management hierarchy, reuse being the first step employed after the disposal.

Finally, the last actor in the textile waste management is indirectly the municipality
owned company, June Avfall & Miljö. We mean indirectly due to the fact that, as pointed
out earlier, the majority of the textile disposed by consumers is though their home
garbage, as it was discussed in the literature review and also confirmed by the Respondent
1 working for the municipality owned company. The value left in textile going through
this way in the RL system is transformed into energy for the citizens. We can say that it
is clearly not the optimal way to recapture textile’s value as there are mixed garments of
high quality and poor quality, and to be sent to incineration should be only the clothes in
the poorest condition.

To facilitate the understanding of the flows of textile by the different actors occurring,
colours have been applied in the Figure 10 below. The blue arrows represent the flow of
textile disposed by the consumers. The grey arrows indicate the activities of Human
Bridge. The only black arrow is the activity of June Avfall, collecting households’ waste
and discarding them for incineration and the orange arrows shows the activities of second
hand stores.
As Rubio and Jiménez-Parra (2014) revealed, the recovery process is the most important feature of a RL system, as it is there that the value is recaptured. We mentioned earlier through the literature along with the findings that most of the apparel households want to get rid of end up in the garbage. Therefore, we can safely assert that currently most of the remaining value of used textile is lost in the actual system.

Nevertheless, one organization particularly, Human Bridge, is doing the most work in order to collect those apparels. Once it has reached their bins, the collected textile is either sent for aid in a country in need or sold at a second hand store in Sweden, that is reused, sold for international sorting companies without any prior sorting performed by them, which will afterwards sell it or recycle, or sent for recycling and being transformed into raw materials for the lower quality garments, however it represents only a few percentages of the total. Textile that is sent abroad is mainly to be recycled later on, due to the fact there is no recycling industry in Sweden.

To sum up about the value retrieval in textile in the current waste management system, most of the remaining value in textile is presently lost as the preferential way to get rid of
the apparels is through the home garbage, ending up in energy recovery, which is the second least preferable step after landfill in the waste management hierarchy set up by the European Commission. The textile disposed of via other channels is either reused, remanufactured or recycled, which are more desirable means for retrieving the value left and put less impact on the environment. However, they still represent a too little part of the total amount of textile disposed by Swedes. Therefore, in the current system there is room for improvement, especially the first tier of the RL, to increase the collection rate of textile that rather goes to channels where their value will be recaptured in a more efficient way and enhance the quality of the outputs of the system instead of being sent for incineration where most of their initial value is lost.

5.2 How can the system be improved to increase the collection rate?

Due to a lack of legislation, there is no official system regarding the management of textile waste on the contrary of materials under the EPR, resulting in the municipality and charity organization carrying out this activity. Therefore, after having determined and analysed how the actors in Jönköping municipality are operating and handling it, we identified several improvements that can be implemented to increase the amount of collected textile in order to retrieve the maximum value remaining in post-consumer textile.

5.2.1 Convenience to Households

The most important aspect to improve the rate of collected garments is to provide easy and accessible means for the households to dispose of their used textile. Presently, Human Bridge is the only actor in the municipality trying to supply an easier access to the households, but it is still insufficient as textile bins should be as close as possible to consumers and thus cover a much larger area.

There are several possible improvements regarding the convenience to consumers. Firstly, placing textiles bins near all FTI’s recycling stations, as it is currently not the case. Nevertheless, in the 9 recycling centres located in the municipality, all of them have a container dedicated to textile, though being rather small compared to the ones for other materials, no real improvement needs to be made.
Secondly, positioning bins near all residential areas where most of the population lives to facilitate the disposal of their apparels. As mentioned by consumers in the findings, they tend to dispose a few clothes at a time when they are for example torn or in poor condition rather than discarding a lot at once, where they are more willing to perform a longer distance to throw their apparels away besides simply in the trash. Accordingly, it highlights the importance of providing easy and convenient access to households, which was pointed out in the literature by Ha-Brookshire and Hodges (2009) to be an essential factor.

In addition, placing textile bins in populated areas is indirectly participating in consumer awareness, since most of our interviewees do not know where the nearest textile bin is from their home as well as what kind of clothes they can dispose of, whether it is only the ones in good condition or all kinds. It could remind them that discarding textile other than straight in their home waste is a possibility, and that it is accessible without too much effort as well as spreading the information to their acquaintances.

Thirdly, another possibility which needs little investment, is to add a new slot in the green bins households already have specially dedicated to used textile, however they would probably need to be redesigned regarding the space. That option would be the most accessible for households and would require no effort for them to dispose of their garments while providing them a higher service level.

In the literature, Jahre (1995) brought up two variables that defines the service level of a RL scheme, the average distance they have to travel to the collection point and the number of households covered by one collection point. If they have a long distance to make, that kind of scheme is a “bring” scheme which is relatively the case in the municipality, consumers having to discard their used apparels to recycling stations owned by FTI or to recycling centres, though it can be a convenient location for part of the population living near those collecting points, as opposed to a “kerbside” scheme where consumers can dispose of their used textile within a short distance. Therefore, to increase the amount of collected clothes the idea is to provide to as many citizens as possible the opportunity to get rid of their no longer wanted textile with little to no effort for them, as it is for other
materials such as food waste, glass, plastic, and so on. To do so, the most suitable type of RL scheme is the kerbside scheme via putting into practice the different elements we elaborated on previously. Ezura A. Jalil et al (2016) called the physical characteristics of the RL system (the aspects that can be quantified and measured) “situational factors” and influence the extent to which households adhere and their recycling behaviour. When looking at the recycling rates achieved by FTI for the materials under the EPR, such as for instance glass, plastic, metal, cardboard and newspaper, they are much higher as compared with the recycling rate proposed in the SEPA’s proposal which stipulated that by 2020, textiles on the market should contain at least 25% of recycled materials. Hence, it is safe to assume that when appropriate disposal is provided to households, and adapted to their characteristics and local conditions, consumers’ adherence to the system along with their recycling behaviour is enhanced. These elements are also called “personal factors” by the preceding authors.

5.2.2 Increase customer awareness and knowledge
Consumers play an essential role in the RL system since they are the first component and being both a source and initial separator. Also, their behaviour and adherence to the RL system determines the quality of their inputs. Their commitment is determined by situational factors as we explained in the previous section about the importance of providing them convenience but it is also crucial to increase their awareness and knowledge in order to have inputs of quality needed into the system.

Hvass (2014) expressed that consumers’ confusion and lack of awareness of the environmental impact of used clothes result in garments ending up in garbage bins. This opinion has been shared by the consumers we interviewed stating that more recycling campaigns should be realized, such as for instance on social media, on TV, at schools and universities, in commercial centres to broaden their knowledge, awareness and commitment. This is as well in accordance with Prothero et al. (2011) declaring that the government has a role to play in increasing the public’s awareness through the elements previously mentioned. In addition, we noticed that consumers tend to mix up quality and price as they think that because they buy an expensive apparel it is necessarily of good
quality. Thus, it is essential to educate them to differentiate which are of good quality from those which are not, since the price or the brand is not necessarily a sign of quality.

Currently, June Avfall & Miljö provides educational visits for young children at schools to explain them how to sort properly and why it is important, but other than that not much is done in educating people in the municipality. Prothero et al. (2011) claimed that consumers of all ages need to be addressed. Indeed, the person interviewed at June Avfall & Miljö declared that after educating young children at school, they were teaching their parents how to do so properly, while he also mentioned that students were the worst at sorting the garbage. Therefore, when deciding to promote recycling through diverse campaigns, they should be targeted towards different ages such as it is done by marketing departments of companies for their products.

In addition, if the suggestion of providing a new slot dedicated to textile in the mix trash citizens have at their home is applied, it would be another mean to increase their awareness and possibly change their mentality about textile recycling by being more prone to dispose of their clothes. That would also be the case with textile containers as it was pinpointed by one of the consumers, that seeing recently new textile bins being placed in his neighbourhood increased his awareness regarding the disposal of clothes.

Lastly, incentives are relevant in increasing awareness and knowledge of consumers as well as encouraging them to separate and sort the waste correctly. Our respondents were positive on the idea to pay less taxes, if they were accepting to have a new slot in their home garbage or to receive bags to put them in. This is conforming to what stipulated Oom do Valle et al. (2009) in the literature.

5.2.3 Developing collaborations
Collaboration between municipalities and the different actors operating is another factor that has to be developed in order to augment the collection rate and the quality and efficiency of the collecting service. Currently, the existing collaborations related to the management of textile waste are the one between the municipality of Jönköping and Human Bridge for the permission of placing the textiles bins, and between Human Bridge
and second hand stores where used garments collected by the charity are resold. This is in accordance with Avfallskaraborg (2016) asserting that collaboration on reuse at recycling centres with charity organizations is growing and becoming more and more common.

However, there is a need to further develop collaboration between municipalities in Sweden to increase the volume of textile collected to be able to build a system that would be economically feasible as many are quite small in terms of inhabitants. Also, in the literature Ekström and Salomonsson (2014) and Oom do Valle et al (2009) stated that in order to achieve this economic feasibility clothing and textiles need to be collected and processed continuously as textile is a volume based material. Currently, Human Bridge collects 13 to 14 tons of used garments per week, and is not always able to handle all of the apparels it receives. Moreover, the charity organization is not operating in the whole country, which makes us believe that the practicability of a textile waste system is clearly possible, at least in regard to the quantity. Nevertheless, it has to be exactly determined which minimum amount of collected apparels is necessary to build an economically viable and sustainable system in Sweden that would see for instance new recycling industries being set up to create new products from recycled materials at a large scale.

In addition, collaboration can be implemented between actors within and between municipalities in order to share their different assets, which can be trucks, warehouses, sorting facilities or personnel in order to consolidate the textile waste and perform the different processes (collection, inspection and sorting, transportation, recycling) more efficiently and effectively. For instance, June Avfall & Miljö possesses 30 trucks and 9 recycling centres, Human Bridge has 5 sorting facilities and 4 warehouses in Sweden. In Jönköping municipality, there are second hand stores participating in the collection and management of textile waste as well, which are also located in other cities in Sweden and unfortunately did not get the chance to interview, but we can assume they have warehouses or sorting facilities to inspect and sort the different apparels and accessories before putting them for sell. Also, in the other municipalities, there can be different players that those in Jönköping, and their resources can be shared in order to beneficiate from economies of scale and scope, with for example the creation of regional centres where the clothing, shoes and accessories would be stored and sorted before being resold.
or recycled. Thus, collaborations between the actors and sharing of their assets would undoubtedly improve the service offered to households to dispose of their clothing along with enhancing the RL processes and the quality of outputs that come out of the system.

5.2.4 IT system
In the literature, Ekström and Salomonsson (2014) expressed the idea that rules and routines used for handling the waste under the Extended Producer Responsibility (glass, plastic, newspaper, metal and cardboard) should be developed in similar ways as well for textiles and clothing since their recycling rate is high. Those materials are managed by FTI and the national system established to handle those kind of waste is performing well.

One element that should be applied to improve the efficiency of the management of textile waste is the set up of an IT system. Indeed, on the website of the organization, consumers can see where the recycling stations are located, their identification number and name, the time when the last collection was carried out for each material, when the next collection is planned and can also file a claim when there is a problem arising for a recycling station such as for instance when the collection has not been performed or a technical issue.

However, a suggestion to improve that existing IT system and be applied to textile, would be to see real-time the weight of each container in order to plan accordingly the collection. Currently, the collection is carried out by Human Bridge’s trucks 3 times a week for populated areas and once a week for the others, regardless whether the containers have reached full load. Consequently, by having the possibility to check in real-time the load of each bin, the different actors would be able to perform the collection in a more efficient way, such as decreasing the traveling distance, polluting less during the collection, saving cost, gaining time as well as planning in an improved manner the transportation, storage and sorting to facilities in order to avoid congestion and the impossibility to handle all the inflow, as it was mentioned by the manager of the sorting amenity of Human Bridge in Huskvarna. To sum up, the development of an IT system for managing textile waste would be beneficial for both the consumers and the organizations performing the processes for value recovery.
5.2.5 Legislation

In the literature, it was mentioned possible life-cycle-based directives for the textile industry in the EU and was discussed the potential introduction of the EPR already back in 2012. However, in 2018 as we are writing this thesis, this possible measure has not been introduced yet and it is still in debate whether to assign the ownership of textile waste to the producers or to the municipalities. In the case of the EPR is applied in the EU or in Sweden by the SEPA, clothes producers could either outsource this activity to waste companies that possesses the assets and competences to perform its management as FTI is presently doing it for materials under the EPR, or implement take-back scheme through retail stores. Consumers had a positive opinion about such initiative, and would be willing to bring back their no-longer-needed clothes to stores if they have in return a voucher or discount for a future purchase. As nowadays, new collections and trends are going fast, consumption is increasing with a Swedish consumer buying on average 12.5 kg of textile per year, which only a fifth is collected. Hence, that kind of initiative would provide a convenient way to consumers to get rid of their apparels and increase the collection rate for value recreation. However, no respondent could mention a store already carrying out a take-back scheme.

Though, there is not really a need to have a legislation to implement take-back scheme in retail stores, it would definitely be put into action at a large scale within the country or the European area if a legislation involving manufacturers in the management of the waste they produce, be enacted. This would promote new business models such as for example in-store second hand’s departments.

In addition, a legislation where producers would have to abide by to handle their waste, could also force them to design clothes in a way to be durable, repaired and reused as well as being designed for material recycling. Presently, they are labelling requirements to enable consumers to identify the type of material clothes they intend to purchase are made of, and a possible suggestion is to be more transparent and provide them with information regarding hazardous substances that can be found in textiles so that they can avoid these substances which would increase the possibilities for reuse and recycling.
6. Conclusion

This final chapter concludes the study by recapitulating the main points of the research questions along with defining the managerial implications. Finally, we end this paper by outlining the limitations of the study and suggestions for further research.

In conclusion, this paper fulfils its purpose of exploring the current post-consumer textile management system of Jönköping municipality as well as suggestions for improvement in order to identify how best value can be recaptured from it. The two research questions were answered by considering the scope of the study and it delimitations.

The first research question addressed the exploration of the current system of managing post-consumer textile waste in the municipality of Jönköping and how is the value retrieved from this material. To answer this question, the system thinking theory was adopted to analyse Jönköping’s textile waste management system. We found out that presently there is no ‘official’ system to manage textile material discarded by the consumers. Only a few players are collecting and processing it with the equipment and infrastructures they have. June Avfall & Miljö is the municipality owned company in charge of collecting and disposing households’ waste. Therefore, this company participates indirectly in the management of textile waste as a majority of textile disposed of by citizens is through their own garbage, mixed residual waste which are afterwards sent to incineration for energy recovery. By this way, used textile loses almost all its remaining value.

Next, there is the charity organization Human Bridge. They positioned several textile bins around the municipality, often near FTI’s recycling stations and in recycling centres. After being collected, all used textile goes to the sorting facility located in Huskvarna for further processing. From this facility, they will either be sent to be resold in Lindra second hand stores or Erikshälpen with which they are collaborating, shipped to Eastern Europe without any prior sorting in the facility or sent to be recycled where only the textile in poor condition goes after being sorted.
Lastly, Myrorna second hand stores or the charity organization the Red Cross also collect used apparels, but to a minor extent. Myrorna possesses only three textile bins in the municipality, while the Red Cross collects it solely directly from their store. Thus, they represent a tiny part in the unofficial textile waste management system occurring in the municipality. To sum up, as there is no legislation to assign the ownership of textile waste and consequently who has to manage it in Sweden, municipalities with their different actors handle it in the best way they can. In Jönköping, Human Bridge, and to a lesser degree Myrorna, Erikshjälpen and the Red Cross manage its collection and further processes in order to retrieved the maximum value of it, however it is not their obligation.

The second research question discusses the possible improvements to be put in place in order to increase the rate of collected garments for further processing and maximize value recreation. We elaborated on 5 points that could potentially enhance the current system of the municipality, namely the convenience and accessibility to households, increasing their awareness and knowledge, developing collaborations, establishing an IT system and finally legislation. The convenience and accessibility to households is probably the most important aspect among the 5, by covering a large area and being close to consumers in order to gather as many apparels as possible and augment the collection rate. Increasing their awareness is another element that should be taken into account, as consumers are the first tier in the RL system. By educating them through recycling campaigns on social media, TV, schools or universities and commercial centres for instance, the quality of their inputs in the system can be ameliorated to generate better outputs.

Developing collaborations between municipalities as well as between actors operating would enhance the efficiency and effectiveness of the different processes performed, such as the collection, transportation, inspection, sorting, or disposal, especially in regards to the economic feasibility as many municipalities are too small in term of inhabitants to have a viable and durable system on their own. This would be particularly important to develop if a legislation would be approved nationally where the ownership to textile waste handed over to municipalities.

Establishing an IT system would improve the efficiency of the players performing the collection, transportation, storage and sorting of the garments by for instance avoiding
congestion at specific facilities or performing the collection more effectively. From the consumers’ side, having the possibility to see directly from a website information such as where are the different locations to dispose of their garments, when the last collection was performed or if a container is full for example, would further increase their willingness and adhere to the system.

At last, the legislation aspect is influential and can shape the whole future system of textile waste. A new regulation stating the ownership to either municipalities or producers and fixing reuse or recycling targets to reach will determine the different roles that the actors have to carry out and enhance the outputs generated by the current textile waste management system.

6.1 Managerial Implications

The research carried out from January to May 2018, is in accordance with the ongoing discussion about implementing a nationwide textile waste management system by the SEPA. By focusing on one municipality, we had an understanding of the way it is executed in a part of the country, and could make several proposals for improvements in regards to an upcoming legislation. Thus, this study provides the personnel of Jönköping municipality with an overview of the current “unofficial” textile waste system, by identifying the actors operating and their role as it is presently not their obligation to handle textile waste, as well as determining potential improvements to be implemented for facilitating the amount of used textile collected and best recapture the value remaining for economic and environmental reasons.

Also, the research exposes the expectations of the consumers regarding their engagement in the waste system and the recycling of textile in which the municipality can use as an evaluation for further enhancements of its service level.

6.2 Limitations of the study

This research encounters several limitations. Although we believe that the interviews of June Avfall & Miljö and Human Bridge as well as the observations carried out at a
recycling centre and sorting facility of textile were sufficient to fulfil the purpose of the research, more actors present in the municipality could have been included such as second hand stores, retailers, or the charity Red Cross but unfortunately, they were not willing to participate in the study.

Moreover, we focused on one case only, and the municipalities in Sweden have the possibility to choose themselves how to organize the waste management locally. With the upcoming legislation, expected for the end of this year, we can assume it will result in similar ways of handling textile waste among municipalities and therefore can generalize the findings found in Jönköping to other cases, but currently as we are writing this thesis there is no legislation yet and thus our findings and recommendations might be altered once the accurate targets to achieve regarding the recycling of textile material have been released by the Swedish Environmental Protection Agency, which unfortunately did not have the possibility to interview a member of the board.

Lastly, we used the System Thinking Theory to investigate how the municipality and its different actors are managing the textile discarded. However, system thinking is meant to study a system which already exists, and in our case there is currently none yet. We used it as a theoretical basis for answering the research question to elaborate a system that can be implemented once the legislation has been adopted.

6.3 Further Research

With allusion to the previously mentioned limitations, for further research it can be included the actors we did not have the possibility to interview to investigate how they could be part of the future textile waste management system that will be determined: second hand stores, Myrorna and Erikshjälpen, the Red Cross and also apparel producers and retailers such as H&M.

In addition, we did not integrate in our study any financial aspects regarding the recommendations emitted for potential enhancements. Incorporating cost-elements to consider in a further study, may provide municipalities or other decision-makers at a local or regional level the feasibility of the model.
This research was based on the awareness of the release of a new legislation about textile waste, however along this study we did not exactly know the specific targets concerning reuse and recycling to be effective in the near future. Hence, more accurate results can be achieved once the legislation will be voted and enacted, and objectives to comply with known for the current actors in the textile waste management system.
Reference list


