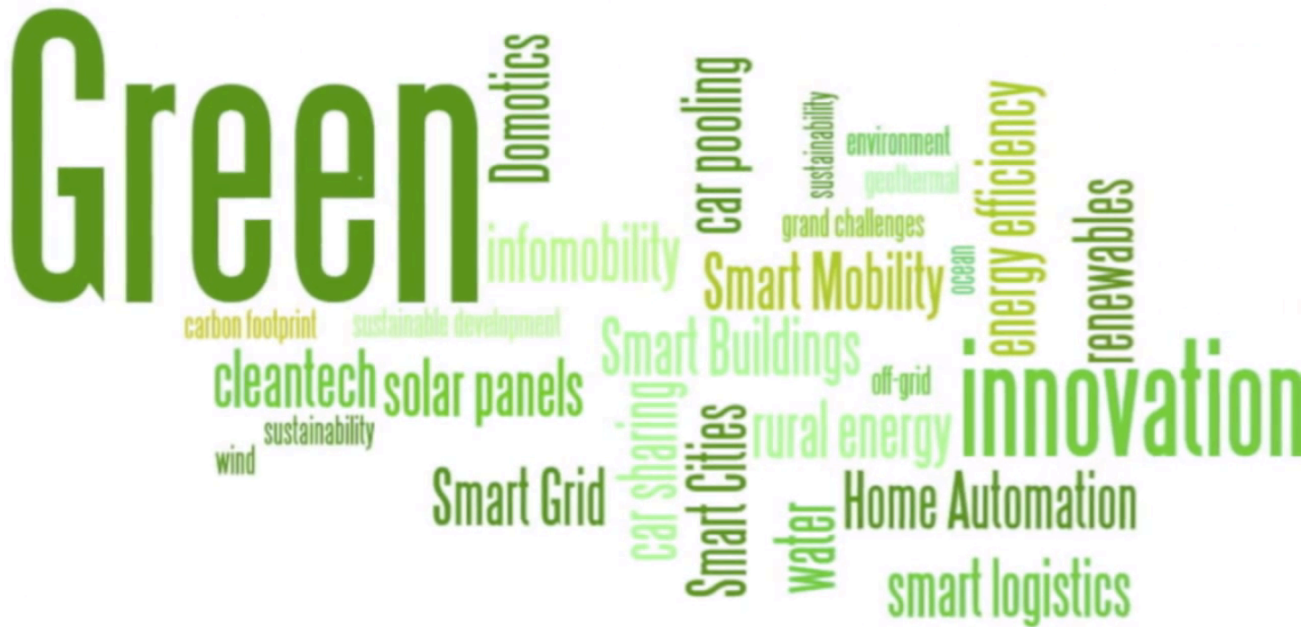




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# Developing Urban Waste Disposal System: The Role of Stakeholders

A Case Study of Stakeholder Values in the area of Waste Management in  
Gothenburg

Master's Thesis in the Master's Program International Project Management

ELIN GUSTAFSSON

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Department of Civil and Environmental Engineering  
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Master's Thesis BOMX02-16-137  
Gothenburg, Sweden 2016



MASTER'S THESIS BOMX02-16-137

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ELIN GUSTAFSSON

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Examensarbete BOMX02-16-137/ Institutionen för bygg- och miljöteknik,  
Chalmers tekniska högskola 2016

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Chalmers Reproservice / Department of Civil and Environmental Engineering

Gothenburg, Sweden, 2016



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## ABSTRACT

Understanding customer demand is seen as advantageous in the hypercompetitive environment that prevails on the market today, with greater amounts of businesses operating globally. It is therefore crucial to succeed through small means, and the investigation of stakeholder values is an important matter today in order to persuade customers by offering products or services where value exceeds price. Developing sustainable solutions for waste management and disposal system is a challenge for cities, which affects many people daily; however, various actors may have a different understanding and value solutions differently. This study is made in collaboration with Envac Scandinavia AB, which offers waste disposal systems. The study examines the value perspectives from the users, developers, construction companies, and authorities point of view regarding waste disposal systems. Implications for theory and practice are further offered and a value proposition is made to Envac's customers based on the results given from interviews.

Key words: Stakeholder Management, Waste Management, Value Management, Waste disposal systems, Stakeholder Values, Value proposition, Value dimensions

## **Utvecklingen av Hållbara Avfallshanteringssystem: Intressenters Roll**

En fallstudie av Intressentvärden inom Avfallsindustrin i Göteborg

Examensarbete inom masterprogrammet **Error! Reference source not found.**

ELIN GUSTAFSSON

Institutionen för bygg- och miljöteknik

Avdelningen för Construction Management

Chalmers tekniska högskola

### SAMMANFATTNING

Då en extremt konkurrenspräglad marknad råder idag, på grund av att allt fler företag verkar globalt, ses kunskap om efterfrågan för produkter och tjänster som fördelaktigt. Det blir viktigare och viktigare att lyckas genom små medel. Genom att undersöka intressentvärden intar man en bättre position för att kunna övertyga kunder genom att erbjuda dem produkter eller tjänster där värdet av produkten överstiger priset. Avfallshantering och avfallssystem är produkter och tjänster som berör människor dagligen, således har många människor också olika syn på värden relaterade till dessa system. Denna studie är gjord i samarbete med Envac Scandinavia AB, vilka erbjuder avfallshanteringssystem. I studien undersöks värden utifrån perspektiv från användare, utvecklare, myndigheter, och byggföretag gällande avfallshanteringssystem. Vidare är konsekvenser av teori och praktik presenterat och förslag på vad Envac kan erbjuda deras intressenter, baserat på identifierade värden, har tagits fram.

Nyckelord: Avfallssystem, Avfallshantering, Intressentvärden, Stakeholder Management, Value Management, Värddimensioner, Värdeförslag



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## **Preface**

In this research, interviews with waste disposal stakeholders have been made. The research has been conducted from January 2016 to June 2016. The study has been carried out at the Department of Civil and Environmental Engineering, division of Construction Management, at Chalmers University of Technology in Sweden as well as Northumbria University in Newcastle upon Tyne. A case study about a disposal system company's stakeholder values has been made regarding different waste disposal systems. The company studied was Envac Scandinavia AB and their stakeholders in Gothenburg. Interviewed stakeholders represented stakeholder groups such as construction companies, developers, authorities and users.

The research has been conducted with Elin Gustafsson as a researcher and Martine Buser as a supervisor. All interviews made have been carried out from different locations in Gothenburg at stakeholder's offices; the analysis of the results has further been conducted from the office of Envac Scandinavia AB in Gothenburg. Supervisor Martine Buser is highly appreciated for all help and support during the writing of this report. I would also like to take this opportunity and express my special thanks to Envac Scandinavia AB and the employees for their co-operation and involvement in this report. Thanks to Christin Carlsson at Miljöbron for acting supportive when needed and also a big special thanks to the amazing people Susanne Klintred, Mikael Pernheim and Magnus Sjöstrand at Envac Scandinavia AB, who has supported, and has been giving input and feedback in times of trouble.

I would also like to thank my family and friends, who has given love and has supported me in finalizing this project.

Gothenburg May 2016

ELIN GUSTAFSSON







# 1 Introduction

The modern society of today increasingly focuses on issues of sustainable development. Problems that are discussed to a higher extent is how to reduce transportation, how to make building processes as efficient as possible, effects of different working and living environments and how to achieve as low carbon footprint as possible (Avfall Sverige Utveckling, 2013). Despite the fact that waste collectors work as hard as they can to keep the streets of cities clean, the problem of an increased amount of waste remains. The wealthier we get and the greater the population becomes, the greater is the amount of waste we generate. Waste has become a great problem to our modern lifestyle (Envac.se, 2016). This report will accordingly focus on the problem that waste management represent. It will contain viewpoints from stakeholders' perspective and how they perceive value regarding different waste disposal systems for housings. The report is written in collaboration with Envac Scandinavia AB, which is one of the most successful companies when it comes to disposal systems based on the vacuum technique as well as the optical sorting technique. The main focus of this report will be stakeholders', how value is created and perceived, waste disposal systems, and what kind of waste situation prevails in the city of Gothenburg. This chapter includes the background of the study, the purpose, research questions, objectives and limitations.

## 1.1 Background

The Project Management Body of Knowledge, PM BoK, (2013) describes that stakeholder satisfaction should be managed as a key project objective. One needs to maintain and focus on continuous communication with a company's stakeholders in order to understand their needs and expectations. Stakeholders are people, groups or organizations that severely could impact the project outcome, and the importance of understanding their demands are therefore of significant matter. Every project will have stakeholders which will impact the project in either a positive or a negative way, the project managers ability to establish proper communication between the parties might therefore mean the difference between project success or project failure (PM BoK, 2013). By using simple procedures and investing modest effort towards stakeholders can make a big difference to project outcomes. Stakeholder management is a set of techniques that harnesses the positive influences and minimizes the effect of the negative influences (APM BoK, 2012). Alexander, Miesing and Parsons (n.d.) states that by knowing what variables contribute to a successful relationship with different stakeholders will likely have a beneficial effect on a company's strategic actions.

Other applications to beneficially affect a company is to create customer value, and many organizations strive to create value through different projects (Eskerod & Jepsen, 2013), and due to the hypercompetitive environment that prevails on the

market today the more crucial it becomes to succeed through small means. According to Matzler, Bailom, Anschober and Richardson (2009) superior stakeholder satisfaction is of great importance for successful companies. They (ibid) also states that the more intense the competition, the more transparent the markets, and the lower the switching barriers for customers are, the more important it is to persuade customers of the value of a product or service – that is, of the customer value. Suppliers can further use their understanding of value to strengthen performance and to gain a competitive advantage in various situations. The knowledge of customer value can be used to customize solutions to services, programs and systems in current market offerings, but also to guide the development of new offerings as well. The documentation of delivery of superior value, the learning about value, and the integration of the learning's into the business might also generate in new customers and better customer relationships (Anderson & Narus, 1998).

A good relationship towards a company's stakeholders will, as mentioned before, likely have a beneficial effect on the company. The waste management industry has many stakeholders, accordingly also with different approaches and viewpoints towards different waste disposal systems. It should therefore lie in a waste management company's interest to establish a good relationship towards its stakeholders. Waste disposal systems is something that many people have an opinion about, since it is something every household encounter almost daily. But it is however problematic. Waste is generated in a greater amount than ever before. Our economical development today is based on the production of products and services, as well as consumption of the aforementioned. The increased consumption of products eventually becomes waste - waste that has to be taken care of. The amount of waste is rapidly growing, even faster than the pace the population is growing, and it has become an issue around the world (Johansson & Salonen, 2004). However, many individuals are notoriously unwilling to assume responsibility for environmental goods (Ashley et al., 1999) and this has to change. According to Dahlén (2008) evidence shows that property-close collection of dry recyclables leads to increased collection of sorted metal, plastic, and paper packaging. This is certainly an important aspect to consider when designing and constructing buildings in order to encourage a recycling behavior. Four factors have been identified as important for the future development of waste collection systems. These factors are: convenience of separate collection of recyclables and hazardous waste, information and communication programs, type of waste collection fee, and the role and function of supervised recycling centers (Dahlén, 2008). However, Sundberg explains that there has been an on-going debate regarding a potential “waste infarction” in Gothenburg (Gustafsson, 2009). The risk is that we are heading in that direction. The amount of waste will grow in the same pace as we consume and the likeliness of people cutting down on their living standards in order to reduce the amount of waste is not very credible. The current situation is untenable and something has to be done. The increasingly amount of materials flowing in the society is long-term-wise unsustainable. Politicians and scientists agree. Yet, there are many actors on the market that strive to increase this



flow of materials even more (Sundberg in Johansson & Salonen, 2004). Studies have shown that consumption is, by far, our biggest hobby. It is also the hobby that is increasing the most (Sundberg in Johansson & Salonen, 2004). People in Sweden today is of that general opinion that there apparently is a well-functioning waste management that is reliable, and the increasing amount of waste is not very visible to people in general, and the problem might therefore be hard for people to relate to. If a shift in consumer's mindset is not achievable due to the general opinion of a well functioning waste management, there is instead a need for a sustainable system that takes care of the increasing waste problem. There is ultimately a need for efficient and effective waste management solutions.

But how does one make people more willing to contribute and take responsibility for their waste? There have been stated that the easier it is for people to recycle, the more willing they are to do it. Property close collection is therefore of importance, but the focus also needs to be put on smart and efficient waste disposal systems. It also has to be put more focus on what people value when it comes to disposal systems, it is the people who recycle and it is therefore a need for investigating stakeholder values when it comes to existing systems. The value for different people might differ when it comes to different disposal systems, depending from which stakeholders' perspective to look from. I.e. stakeholders hold different opinions on what value is and what it means (Benghi, 2015). Similar to the saying "one man's trash is another man's treasure" is different opinions of value of a particular object or item, it may be considered to be of great worth to one person, however to another it may be of insignificant value or even worthless (Benghi, 2015).

The waste disposal systems that will be included in this report is: the traditional system consisting of bins collected by refuse lorries, the vacuum system consisting of an infrastructure of pipelines underground that vacuums the waste to a facility outside the urban area, and also the system of optical sorting; a system consisting of different colored bags to sort the household waste in, which further is sorted automatically in a waste facility according to color. The report is written in collaboration with Envac Scandinavia AB, which is a company whom offers vacuum waste disposal solutions, and also an optical sorting system, for waste disposal in housings. Envac developed the vacuum technique the 1960's and is today known as the automated waste collection system using vacuum technique. Envac's systems is established and implemented worldwide and Envac has 35 offices in 22 different countries. As for now Envac's mobile vacuum system and the stationary vacuum system is established in some housings in Gothenburg. The optical sorting system is however not implemented yet as a system in Gothenburg, since such a facility does not exist in the area. Further reading about the company and the different waste disposal systems can be made in appendix B and C, which gives the reader a deeper understanding in the subject.

The report further includes a case study of the company and its stakeholders. The report consists of information regarding the situation prevailing in Gothenburg from a stakeholder value perspective. Several interviews have been conducted with actors representing different stakeholder groups. The stakeholders interviewed are divided in different groups depending on their interest in Envac's systems. The stakeholders' values are being investigated are waste disposal users in housings, waste system developers, authorities in Gothenburg, and buyers of the systems. This report is highly topical and of great value to the company, since Envac has not identified their stakeholders in Gothenburg before. It is also of significant matter since Envac has stated that: "... we must perceive our customers as our partners. A partnership model that is only possible if there is a mutual vision of how we want our waste management to work" (Envac, n.d.). Identifying stakeholders and stakeholder values, and also understand it, is of significant matter if striving to achieve such a mutual vision. Also the fact that the city of Gothenburg is developing in a fast pace and is being densified is a matter of interest. Gothenburg is the city with the greatest urban development in the Nordic countries, with 25,000 planned new apartments and 45,000 new workplaces, which will be built in the city center (Bobbyhouston, 2016). There is accordingly a great opportunity to affect the urban development in Gothenburg, with regards to waste disposal systems.

## 1.2 Purpose

As a future project manager it is of interest to investigate the effects of stakeholders, how they perceive value, and how it further affects a business. The purpose of this report is therefore to discover and understand a specific situation, in a specific industry. The report will focus on investigating the waste management industry, to look at its stakeholders and to identify value from stakeholder's perspective and also to exploit existing management tools in order make new value propositions to the company's stakeholders.

Furthermore, the aim of this research is to investigate the area of stakeholder value with regards to different waste disposal systems in Gothenburg. Also how this information can be used at one of Sweden's leading environmental engineering companies focusing on the area of automated waste disposal systems, Envac Scandinavia AB. The slogan of Envac claims that Envac is removing waste, and by doing so also creating value. This report will therefore focus on identifying stakeholder values with regards to different disposal systems in the waste management area in Gothenburg. As a future project manager this information will contribute to a deeper understanding of management tools and how they can facilitate the establishment of value propositions addressed to different stakeholders. It will also increase the knowledge of the importance of understanding stakeholder values. The contribution of this report addressed to Envac is further an increased knowledge about who Envac's stakeholders are, and also how Envac's stakeholders define and perceive value, so that the company can better develop its business models and address their

customer segments. This information will further be of advantage for the company when selling and establishing new projects as well as when making strategically actions in Gothenburg.

### **1.3 Problem Formulation**

Envac wants to gain a better position on the market and trying to understand their stakeholders, and because of the potential benefit one can gain through market-knowledge and stakeholder satisfaction, Envac wants to increase their market knowledge by investigating what their stakeholder's value. As for the purpose of this study, these main questions are to be answered in this report:

- Who are Envac stakeholders?
- How do Envac stakeholders value the different systems?
- How can business models contribute to develop new management tools?

In the following section the associated objectives is stated.

### **1.4 Objectives**

The objectives of this study are:

1. To understand the concept of value management
2. To investigate if and how stakeholder opinions differ with regards to waste disposal systems
3. To identify the advantages and challenges with the different systems from the perspective of Envac stakeholders

### **1.5 Limitations**

This report has been written in collaboration with Envac Scandinavia AB, purpose and objectives are those stated in the sections written above. Interpretations and opinions are made by the author of this report, unless otherwise stated, and reflect the conclusions drawn by the author. Other opinions might occur, but if so it is stated and referred to.

There is only a handful stakeholder opinion's that has been taken into consideration in this report, a list of which can be seen in the method section. The stakeholders of interest that was interviewed was chosen in collaboration with Envac, and will ultimately not give an overview of the entire picture prevailing in the waste industry in Gothenburg. Some interviews were unfortunately not scheduled due to the participants' limited time. Other prospective interviewees were contacted, but they

unfortunately refused to participate, either because they did not believe that they had the required experience, or because they advised to contact responsible authorities instead. Other waste entrepreneurs, such as Renova, have therefore not been interviewed, even if that would have contributed to a more trustworthy and equitable result.

The stakeholders that have been identified in this report are only those relevant for projects carried out in Gothenburg and are not applicable for other projects made by Envac in other parts of the world, since waste management is governed locally.

The laws and regulations might differ in different municipalities since there are different decision makers in different cities. Gothenburg is, for instance, highly influenced by the visions of the head architect of Gothenburg, Björn Siesjö. It is furthermore a city ruled by the Swedish party, the Social democrats, which in turn are highly influenced by the Green party.

The report will only focus on waste disposal systems for housings, not for industries or such.

## 2 Method

“*We need a method if we are to investigate the truth of things*” (Descartes, 1637 in Dahlén, 2008).

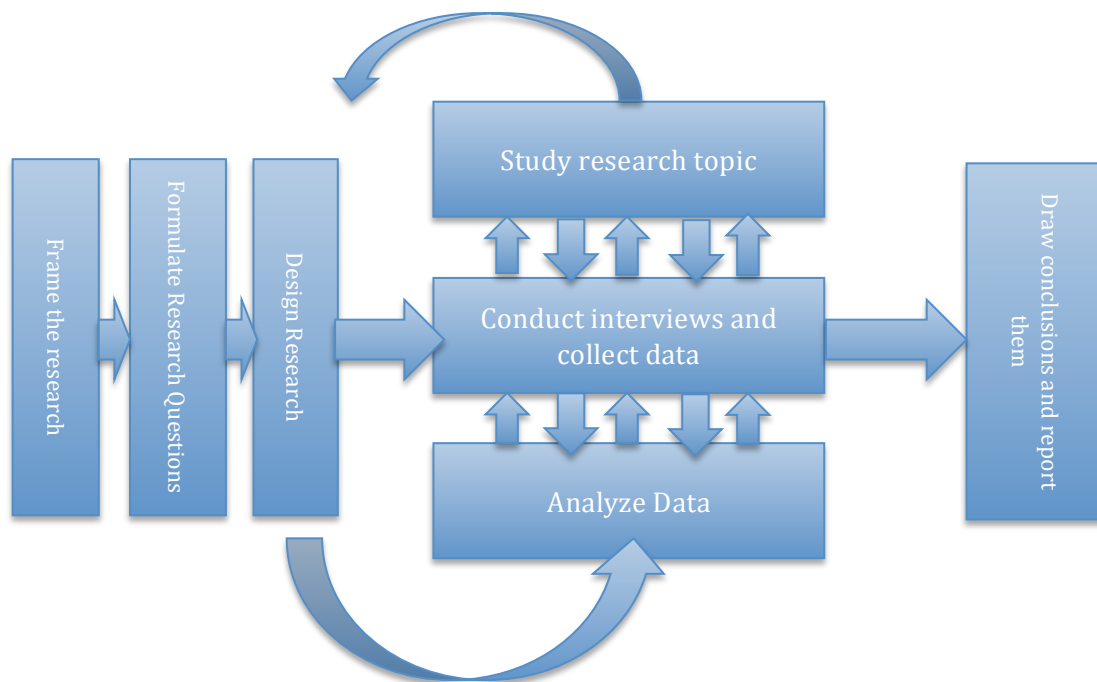
According to Hart (2005), all research has a starting point - thinking about and formulating a topic. When starting to design a research and read literature the methodological considerations and issues arises, meaning the assumptions the researcher choose to make as the basis for doing research (Hart, 2005). This report is based on the case study made at the company Envac, at their office located in Gothenburg. Envac is a company which offers different solutions for waste management and operates in the private sector as well as in the public sector.

As the aim is to discover and understand a specific situation, this research will be an exploratory study based on a qualitative research approach; the research design is of a case study design. A case study design involves the detailed and intensive analysis of a single case, i.e. a person, a group, an organization or a project. Since only one company and its stakeholders will be studied and interviewed, the research design was most appropriate and suitable. The design aims to focus on the complexity and the unique nature of the case. This design is suitable and may be realized in qualitative research designs. This might however not always be the case, and mixed methods are frequently used, meaning both qualitative and quantitative (Bryman, 2012). According to Bryman (2012) the research strategy for the chosen research design *case study* is to intensive study the ethnography or qualitative interviewing of a single case, which may be an organization or project. The research method, the way data has been collected, that has been used in this report is through structured interviews and by participant observations. Data analysis was made throughout the entire writing process, simultaneously as the collection of data, and was constantly checked.

This chapter includes the methods used to collect data, the methodology as well as ethical considerations and trustworthiness. In the following section a more thorough description about the methodology will be presented.

### 2.1 Methodology

The collection of data, which made it possible to analyze findings and get a result, was made through different methods. The gathered data for this report, along with the studied theory in the area and the findings, ultimately contribute to the establishment of a conclusion. Figure 1 represents the research process presented in a chart.



**Figure 1.** *Research Process Chart*

This research will take on a qualitative research approach. If one is to investigate and are interested in the world views of members of a certain social group, a qualitative research strategy, that are sensitive to how participants interpret their social world, is to prefer (Bryman, 2012). The qualitative research method allows the researcher to have an abductive approach, which implies that observations and finding evolves and is constantly checked. The abductive approach means that data collection and analysis should be done hand- in-hand, with constant checking back and forth. This approach is useful in producing concepts (Dubois & Gadde, 2002).

The research that has been conducted includes the study of interviews made, observation, findings and existing research and has then be transformed into a concept only applicable for Envac and its stakeholders. A positive epistemology position has been taken on, i.e. a position that advocates the application of the methods of natural sciences to study of social reality. The knowledge was further gained through the collection of facts and served as the basis for laws; this is again connected to the abductive approach. Further, the positive epistemology position also stresses that science must be conducted in a way that is objective and value free (Bryman, 2012). Bryman (2012) further describes an epistemological position as the urge to understand the social world through an examination of the interpretations of the world through the eyes of its participants; this is the approach of an interpretivist. This research takes on an interpretive approach, since the focus lies on identify values from participants point of views.

The research consists of interviews held with different chosen stakeholders. Ideal for this research would also have been to take on the ethnography/participant observation for every chosen stakeholder of this report and be immersed in a social setting over

time, in order to observe and listen, to gain an understanding of the culture of a group (Bryman, 2012). Advantages with participant observations are for instance that it allows behaviors to be observed directly. In survey research, for instance, one does not *observe* behaviors; respondents instead *report* their behaviors (Bryman, 2012). One example of this is if doing a research of the usage of mobile phones, respondents might not be aware of their usage frequency and might interpret it differently; therefore they also might over- or under-run their answer. By observing their time of usage one might gain a more accurate understanding than if conducting a survey research for instance. Accordingly, if immersed in a social setting over time certainly broadens perspectives. As stated before, as for this report participant observations were only made at the office of Envac, since it was in that setting the report was written and carried out. Immersing in a social setting over a period of time was not possible for every stakeholder that was chosen for this report, since it would have required more time. The observations made at Envac are of an unstructured observation character (Bryman, 2012), meaning that the observations were made without the use of an observation schedule.

## 2.2 Gathering Data

The following methods has been used to gather data:

1. Stakeholder identification
2. Interviews
3. Interactions
4. Site visits
5. Observations

Following is an explanation about the methods and how they were conducted.

### 1. Stakeholder identification:

This study contains stakeholder management as a tool. The tools used through stakeholder management enabled the identification of relevant stakeholders for this study. It further contributed to the information of which relevant actors that was needed to interview and talk to in order to establish a result. The stakeholders were identified through a brainstorming session with Envac employees in order to later assess their interest and influences on operations made by Envac through a power/interest grid, which also was made in collaboration with Envac. Further, stakeholders of interest were identified and interviews were scheduled. Interviews with chosen stakeholders, and their answers, contributed to a result and a conclusion about stakeholder values.

## 2. Interviews:

The conducted interviews were made with focus on the area of waste management and opinions regarding the aforementioned. Interviewees were Envac stakeholders belonging to different stakeholder groups of interest. The groups of interest and the selection of those stakeholders were made in collaboration with Envac, in order for them to gain a deeper understanding and knowledge of those stakeholders. The reason for that the choices of stakeholders were made in collaboration with Envac was to assure that the interviewees had the requisite knowledge relevant for the research topic, and that the stakeholders also were of interest to Envac. Interviewees were representatives from authorities and organizations whom to some extent contribute to the urban planning and waste management in the city of Gothenburg. Other interviewees were users of waste disposal systems. Interviews were also made with developers of waste disposal systems such as the vacuum system and the optical sorting system. Interviews with other stakeholders was supposed to be made, some of them did however not want to participate.

The interview questions were structured, meaning that a fixed interview schedule was used, using the same questions to every interviewee belonging to the same stakeholder group. The interview questions were however of an open question character, since the respondent is able to answer in own terms. Open questions also opens up and allow new, unexpected responses. Interviews lasted between 20-60 minutes and were audio recorded; they were further transcribed and analyzed.

As stated, chosen interviewees were made in collaboration with Envac employees. Areas of interviews to focus on were from perspectives from *Construction companies*, *Authorities*, *Users* and *Developers*.

### *Construction companies:*

The interviewees that were held with *construction companies* representatives had project managers positions or project directors positions and worked with large-scale construction projects, the companies chosen were large companies operating all over Sweden and some of them also operated international.

### *Authorities:*

Interviews held with representatives from municipal *authorities* were from Recycling and Water, who are responsible for reviewing floor plans for new constructions and ensure that the waste handling process are thought through properly, and also from The Traffic office, which are responsible for looking at traffic safety when it comes to disposal systems.

### *Users:*

Interview held with *users* was made with one interviewee responsible for the vacuum system installed in one community in the city of Gothenburg. Interactions with people



living in the area have also been made, however not recorded. One user living in another area with the vacuum system has also been interacted with.

*Developers:*

Interviews with *developers* of the Envac system were made with the CEO of Envac AB via Skype, online, since the Envac headquarter is located in Stockholm. One interview was also held with an employee at Envac, the employee represents the *developers* as well as the *users*, since the employee also is a user of the traditional collecting system. Observations and interactions with employees at Envac have also been made throughout the entire period of time this report was written.

An overview of the interviewees is listed below:

Interviewee	Role	Area of Interview	Description
P1	Chief Project Manager	Construction	Involved in large scale projects in Gothenburg
P2	Chief Project Manager	Construction	Involved in large scale projects in Gothenburg
P3	Project Manager	Construction	Involved in large scale projects in Gothenburg
P4	Urban Planner	Authorities	Reviewing floor plans from waste management perspective
P5	User	Users	Responsible for the vacuum system in one community in Gothenburg
P6	Project Manager	Construction	Involved in large scale projects in Gothenburg
P7	Traffic Planner	Authorities	Reviewing floor plans from a traffic safety perspective
P8	User/Developer	User/Developer	An Envac employee newly recruited, also a user of the traditional disposal system
P9	CEO	Developer	CEO of Envac AB involved in operations made by Envac worldwide

**3. Interactions:**

This report was written and conducted from the Gothenburg office of Envac Scandinavia. 1-5 days per week was spent at the office and interactions and observations of the company and the people working at the office were made during this period of time. The report therefore consists of interpretations and information

given from the observations and the daily interactions and is of informal character since the information given was not recorded. The report will therefore contain information given through these observations and interactions. The people that will be referred to, that only have been interacted with and are informal informants, are:

Informal Informants
Envac Employees
Head Architect of Gothenburg
Movac driver
Residents living (or have been living) in communities with a vacuum system

#### 4. Site visits:

Site visits have also been made to areas where the vacuum system has been installed. The visited sites were at Kvillebäcken in Gothenburg, which is a new built area and has a stationary vacuum system providing 1600 apartments. A site visit to another housing area in the city center equipped with a mobile system was also made. That mobile system was installed in 1980 and provides a smaller amount of apartments with the mobile system.

#### 5. Observations:

Furthermore, since the report was written from the office of Envac, observations about the company and its employees has been made. Information regarding the company has been presented during the time period through participation in monthly staff meetings. The different presentations were held by different people, including: the CEO of Envac AB, the CEO of Envac Scandinavia AB, the CEO of Optibag (the subsidiary of Envac working with optical sorting), and the head of the marketing department. The findings in this report were furthermore presented during a strategic meeting with the market division of Envac as well as with the CEO of Envac Scandinavia AB in April 2016.

The different systems that will be compared are three different systems that Envac offers, namely the *Optibag* system, the *Stationary vacuum system* and the so-called *Movac* system. Another system that also will be compared to those Envac offers are the system of collecting waste manually through the more traditional waste container collection system.

## 2.3 Trustworthiness

Trustworthiness is aspects about a reports credibility, transferability, dependability and confirmability of social research (Bryman, 2012). Trustworthiness is an alternative set of criteria to assess the quality of a qualitative research approach. All of these criteria parallels with the quantitative research internal validity, external validity, reliability and objectivity. According to Bryman (2012) many writers have applied

concepts of validity and reliability to qualitative research, but have slightly changed how the terms are used in qualitative research. Many researchers argue that their produced studies should be judged and assessed differently than for those criteria of quantitative research. Trustworthiness is one proposition of a criterion to assess how good a qualitative research is (Bryman, 2012).

The questions with regards to trustworthiness that are to be answered are:

How believable are the findings?

Do the findings apply to other contexts?

Are the findings likely to apply at other times?

Has the investigator allowed his or her values to intrude to a high degree?

This research is based on conducted interviews. The interviewees' own words are used to describe the situation prevailing in the waste industry in Gothenburg and all of the interviews has been transcribed and recorded; there is accordingly a possibility to check where facts derive from. The results given in this report can further be repeated if interviewing the same stakeholders, with the same questions, which also is a part of the existing transcribed material. The findings in this report are, as stated, only valid for the prevailing situation in Gothenburg and only applicable for the chosen Envac stakeholders. The findings have furthermore been used in the company for planning further strategic actions, which is an aspect testifying of this research trustworthiness.

The researcher has actively chosen to have a close relationship to the company, Envac, during this research and has been working from their office in Gothenburg. There are several advantages with being close to a company while doing research, but the researcher are also aware of the disadvantages of being too close. There is a risk of becoming too biased and lose critical distance to the company. However, the advantages of being close have given a fair insight in the industry, which has given a deeper understanding of the market in Gothenburg.

## **2.4 Ethical Considerations**

The researcher has conducted interviews with participants relevant for the research topic. Interviewee's names will be anonymous and therefore not stated throughout the entire report, the interviewees has been assigned a letter followed by a number and will be referred to as P1, P2, P3 etc. This is abbreviations for person 1, person 2 etc. in the order that they where interviewed. The anonymity applies for the companies they represent as well. There are however some information that will be required to state in the report, such as which industry the person represents or if it is an interviewee representing authorities. In the case if the interviewee represents an authority it will be stated what division the interviewee represents, since it is of importance for the report. The respondents were however able to decide whether they agreed to those conditions or not.

This study will furthermore not include vulnerable people, neither children nor vulnerable adults.

When interviews were made, every conducted interview was recorded, i.e. if the interviewee allowed it. The respondents were always asked in advanced if recording was allowed.

### **3 Value Management**

*“Value is what a customer gets in exchange for the price it pays”* - (Anderson & Narus, 1998).

The market of today has only one certainty – that it is uncertain. One source of lasting competitive advantage is therefore knowledge (Hussain, Lucas & Ali, 2004). Knowledge about stakeholder value is therefore of significant importance to companies today. But how do one define value, and is it possible to measure it? According to Anderson & Narus (1998) there are remarkably few people that are able to answer those questions in a business market. They (ibid) emphasize that pinpointing such a thing as customer value has never been as important as it is today.

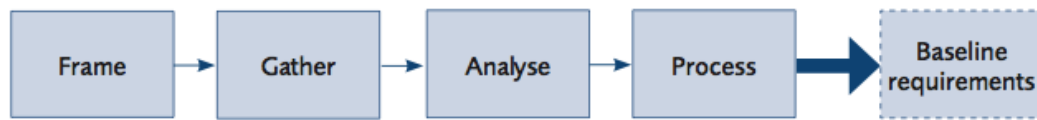
According to Benghi (2015) value management is an organized approach to providing the *necessary functions* at the *lowest cost*. Necessary functions and lowest cost indicate the provision of what the client/customer requires at the lowest possible cost hence, achieving greater value. However, if looking at the APM Body of Knowledge (2012), they provide a broader definition of the value management concept, which also will be the definition of value referred to for this report. They (ibid) state that value management is a structured approach to define what value means to the organization and the project. The framework allows identification and definition of needs, problems or opportunities and then enables of whether the initial project objectives can be improved to determine the optimal approach and solution. Value management is an established and structured approach to both requirements management and solutions development. The approach focuses on value generated by stakeholder requirements (APM BoK, 2012). As previous stated value is a subjective term, and people hold different opinions of its meaning. A product or a service might be of significant matter to one person, but worthless to another.

This chapter will cover the value management process, also the theory about the distinction of value and values. The chapter also contains an explanation about value dimensions, those values that cannot be measured in monetary terms. In order to cover values that cannot be measured monetary-wise, pains and gains, and value propositions will also be presented. Some of these values will overlap and have the same content, but are somewhat complementing each other.

#### **3.1 Value Management Process**

APM BoK (2012) emphasizes that the goal of value management is not to maximize the satisfaction of requirements, nor to minimize the use of resources. It is about establishing a balance that maximizes the ratio between these two elements. So that the customer is satisfied according to requirements, but not to a minimized resource

cost. Figure 2 represents the value management process that relate to requirements management.



**Figure 2.** *Value Management process*

The first step of the value management process is to *frame* the work. It aims to decide how requirements will be managed through high-level principles and in order to maximize value functions such as stakeholder management, risk management, and resource management will be integrated in this step along with requirements management. When framing the work an early assessment of high-level requirements needs to be done. It includes a developed value profile that estimates the relative contribution to the value of each requirement.

When *gathering* the requirements, it can be done in several ways. According to APM BoK (2012) it ranges from personal interviews, surveys and workshops, focus groups, to modelling and simulation. As for this report, the gathered requirements were done through personal interviews, interactions and observations. Some methodologies are designed to enable the continuous gathering and refinement of requirements on the assumption that the stakeholders may not be sure of their needs (APM BoK, 2012). One of the advantages with a formal method, such as value management, is that it allows for lessons learned which could be used to review how requirements have been managed before.

When *analyzing* requirements, information combining schedule management and investment appraisal with certain value-based techniques such as function analysis and function cost analysis is a part of this step. This step contributes to a result of an overall understanding of requirements and what value they bring to the objective. The results of this step are further communicated via individual consultation or group workshops. The aim is to start a debate about functionality and alternative ideas. These can later evolve and be used to examine the value of alternative solutions during solution development.

The next step, *process*, is mainly about providing feedback to stakeholders, building consensus, and generating ideas.

## 3.2 Value and Values

According to Mills and Austin (2014) there is a distinction between value and values. Values are moral principles and beliefs or accepted standards of a person or a social group. Values can be seen as somewhat universal. Value, on the other hand, is a verb or a noun and is the desirability or meaning of a thing. It is possible to measure value;

it is a monetary valuation or a quantifiable amount (Mills & Austin, 2014). Anderson and Narus (1998) claims that value is the worth in monetary terms of the technical, economic, service and social benefits a customer receives. On the contrary, values cannot be quantified as monetary worth in the same way as a value can be done. Every individual or group will have values that are partly unique and partly shared (Mills & Austin, 2014). However, remarkably few suppliers in business markets can pinpoint the value of a product or service to those most important for the business: their customers. Yet, the customer value has never been as important as it is today (Anderson & Narus, 1998). Value is moreover achieved when customer satisfaction exceeds the resources invested (Mills & Austin, 2014).

A market offering is about two things, a product or service price and a product or service value. By raising or lowering a product or service price does ultimately not change the value of the product or service. It rather changes the customer's incentive to buy it (Anderson & Narus, 1998).

$$(Value_s - Price_s) > (Value_a - Price_a)$$

**Figure 3.** *Example of a supplier's market offering*

An example is shown in figure 3 above.  $Value_s$  and  $Price_s$  are the value and price of a supplier's market offering, and  $Value_a$  and  $Price_a$  is the value and price of the next best alternative. The difference between value and price is accordingly the customer's incentive to purchase a product or a service. According to Anderson and Narus (1998), the equation conveys that the customer's incentive to purchase a supplier's offering must exceed its incentive to pursue the next best alternative.

To make a penetrant offering a comprehensive list of value elements must be conducted, i.e. the identification of various customer values (Anderson & Narus, 1998). These elements might be technical, economical, service or social in nature and should capture all potential effects that doing business with a supplier might have on the customer's business. The list must include values from when the customer acquires and uses the product or the service, up until the customer disposes it when it is no longer needed. Important for this list is to not leave out elements that might make the next best alternative to look more beneficial. This is to make the offering more credible (Anderson & Narus, 1998).

### **3.3 Value Dimensions**

It is common to calculate values in monetary terms, since it is easy to picture the benefits by doing so. However, some values are not measurable in that sense, such as social elements. A greater peace of mind might be hard to put a price on. It is therefore differences in terms of value. Some values have to be expressed and presented qualitative, and other values quantitative (Anderson & Narus, 1998). Other

researchers that agree to this, and study “soft-values” perspectives, are Howden & Pressey (2008). They have identified six different dimensions of value in a professional service relationship, from the customer’s viewpoint as well as from the agent’s viewpoint. Their study demonstrated that the customers were primarily interested in elements which create values for them, rather than the attributes (product features). Howden & Pressey (2008) concludes that the dimensions that customer put value to are; *agent’s know-how, trust, personal interaction, service fulfillment, location, and direct/indirect cost.*

The value of *agent’s know how* refers to how well the agent/supplier can advice the customer on their business needs. Interviewees in the study conducted by Howden & Pressey (2008) answered that they needed someone who understands their business without them explaining.

The value of *trust* is a key relational building block. The customer rely on their supplier to tell the truth, business relationships built on trust were therefore essential. In a business relationship, trust has three components which are referred to. Firstly, that the partner behave benevolently to benefit the business relationship. The second component is that the relationship partner always behaves honestly. The last component is that one can trust the partner to be competent in their business role.

*Personal interaction* is the value of having personal service. The fact of having personal service through one person consequently increases trust and the agent’s know how. The efficiency of having one person familiar with the business also reduces the consumption of the customer’s own time, which can be viewed as a non-monetary sacrifice (Howden & Pressey, 2008).

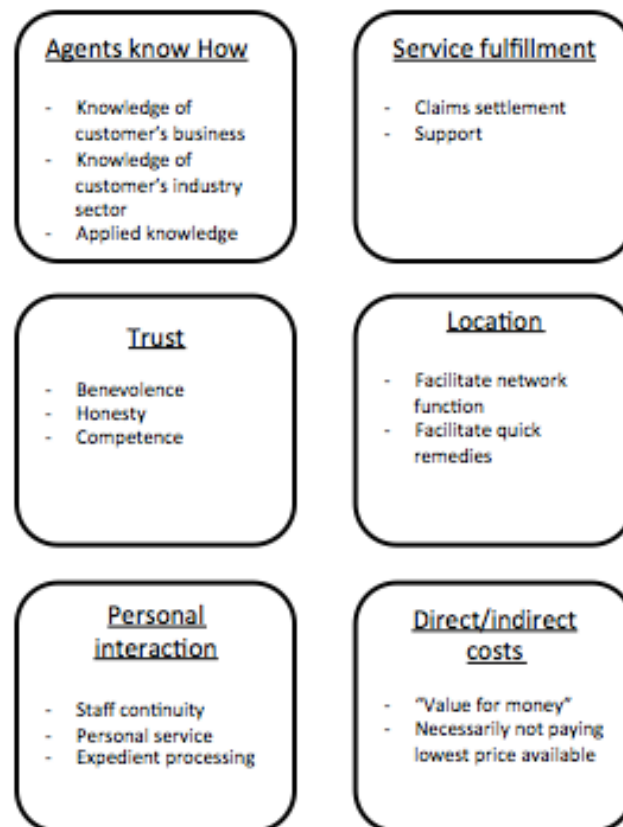
*Service fulfillment* is the fourth value dimension referring to the agent’s ability to fulfill customer expectations. Support that is offered to the customers, beyond what has been contracted, is seen as a great value-adding element. This is related to the value of personal interaction, since it shows an emotional involvement and willingness to help further than what has been contracted.

The value of *location* is the value of being able to have a face-to-face contact with supplier, more personal in that sense than calling a call-center. The knowledge of that the supplier is local is comforting, since customer are able to rely on the suppliers knowledge about the local market. It also eases the other values of having personal interaction, the agent’s know-how, and to some extent trust and service fulfillment.

When it comes to the value of *direct/indirect cost*, the direct costs referrers to the “value for money” the customer gets. However, the study conducted by Howden & Pressey (2008) showed that customers knew that they were possibly not paying the lowest figure available on the market, but paid an acceptable price. Conclusions can



accordingly be made that the other value-adding dimensions played a big part when choosing supplier.



**Figure 4.** *Six dimensions of value*

### 3.4 Pains and Gains

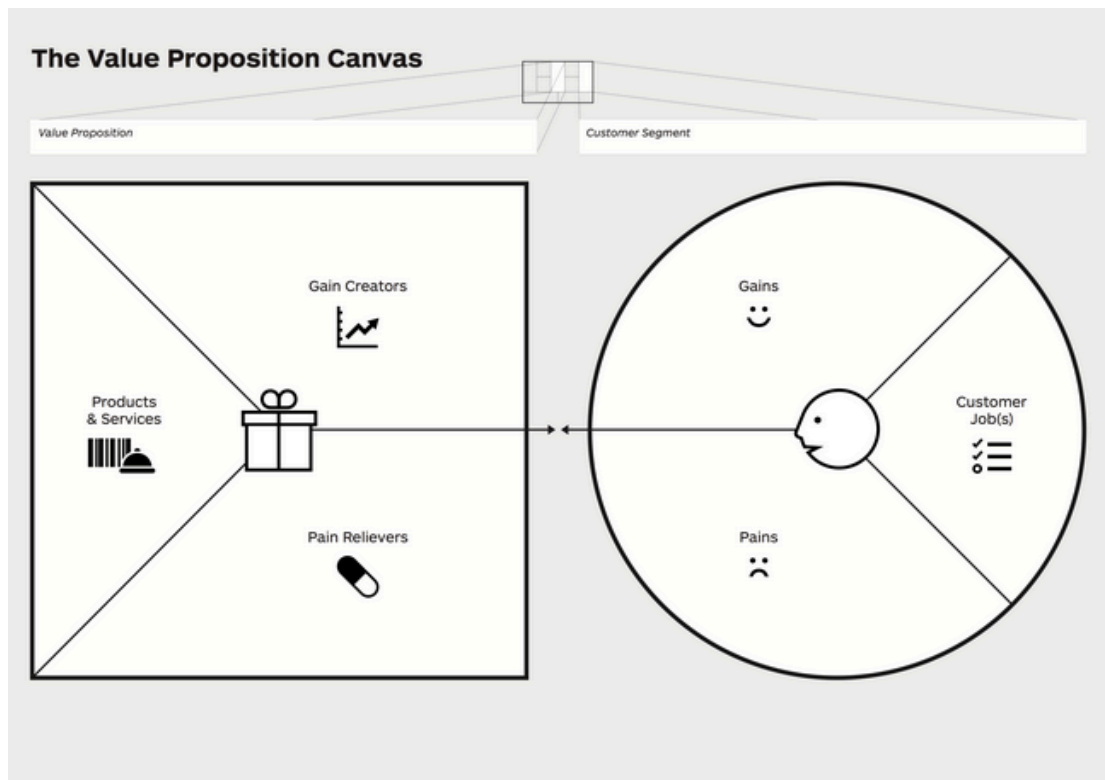


Figure 5. Value Proposition Canvas (Marsden, 2015)

As for the Value Proposition Canvas (figure 5), researchers have identified a few problems with the canvas, such as there are no clear starting point for the analysis, nor any particular order of discussion (Buser & Carlsson, 2016). Even though there is some criticism towards the canvas, only some parts of it will be used in this report and will serve as a theory base. The focus in this report will lie on the pains, gains, gain creators and pain relievers. Figure 5 presents the canvas where the right circle represents the customer segment sector. The left square represents the value map sector (Marsden, 2015).

The customer pains describe the things that annoy or irritate the customer before, during and after getting a job done. It might also be the risks related to the outcome of a job, or not getting the job done at all (Osterwalder, Pigneur, Bernarda, & Smith, 2014). It is important to make the pains as concrete as possible, one example Osterwalder *et al.* (2014) brings up is when a customer for instance states that “*waiting in line for this product is a waste of time*”. The question to ask the customer would therefore be exactly after how many minutes did it began to feel like a waste of time. By doing so, one gets an exact answer to how to prevent this from happen, such as “wasting more than x minutes standing in line will make the customer feel annoyed”. The pains are supposed to be listed by severity (Marsden, 2015 ; Osterwalder, 2014). Further, there are some questions that are important to ask customers when trying to define customer pains, such as how current value propositions underperform for customers, what features do they miss, and what main

difficulties and challenges the customers encounter with the product (Osterwalder *et al*, 2014).

The customer gains is what people require, desire, expect and might expect by getting a job done (Marsden, 2015 ; Osterwalder *et al*, 2014). Just like the customer pains, the gains should also be listed, from “essential” to “nice to have”. There are also important questions to ask customers when trying to identify customer gains, such as specific features customers enjoy, what they wish more or less of, and how current value propositions delight the customer (Marsden, 2015).

The pain relievers are the responses of how one plan to respond to the customer pains before, during or after getting a job done. It is simply how to reduce or eliminate things that annoy the customers (Osterwalder *et al*, 2014 ; Marsden, 2015). One can list the pain relievers by its relevance, from essential to nice to have (Osterwalder *et al*, 2014).

The gain creators is how to meet the customer gains identified and how to respond to what customer expect, do not expect, require and desire (Osterwalder *et al*, 2014 ; Marsden, 2015). Similar to the pain relievers, one also lists the gain creators by its relevance, from essential to nice to have (Osterwalder *et al*, 2014).

### **3.5 Value Propositions**

When analyzed and identified the pains and gains, one is able to make value propositions directed to customers based on the information given through the identified customer pains and gains (Cleverism, 2015).

According to Osterwalder & Pigneur (2010) the value propositions are the reason why a customer turns to one company over another. It fulfills customer needs and offers a solution to a problem. It consists of products or services that caters to the requirements of a specific Customer Segment. The value proposition is accordingly the benefits a company can offer their customers in order to fulfill their needs. Some of the propositions might be revolutionary and innovating, other propositions might however be of an already existing character, but with other functions or attributes (Osterwalder & Pigneur, 2010). As stated before value can be quantitative, i.e. price, speed or service for instance, or it can be qualitative, i.e. design, experience, customers piece of mind for instance. This also applies for the value propositions.

The elements of the value proposition is *newness*, *performance*, *customization*, *“getting the job done”*, *design*, *brand/status*, *price*, *cost reduction*, *risk reduction*, *accessibility*, and *convenience/usability*.

The meaning of *newness* is the value of a new kind of innovative product or service that satisfy a new set of needs that customers never experienced before, a product or

service that has no similar offering. This proposition is often technical related (ecommerce-digest, n.d.).

*Performance* refers to the ability to improving a product or service features, and by doing so create customer value (Osterwalder & Pigneur, 2010).

*Customization* is the proposition of creating value through tailoring products or services in order to fulfill the needs of individual customers. A relatively new trend is the mass-customization approach companies adopt (ecommerce-digest, n.d.).

“*Getting the job done*” is simply as the name states, creating a product or a service that helps the customer to get certain jobs done. Osterwalder & Pigneur (2010) gives an example of Rolls-Royce who understands this value very well. Rolls-Royce’s airline customers rely entirely on Rolls-Royce to manufacture and service their jet engines. This arrangement allows Rolls-Royce’s customers to focus on running their airline business.

*Design* is the element of how a product or service is experienced with regards to design. Superior design can be of importance to many customers, especially in the fashion industry for instance (ecommerce-digest, n.d.).

*Brand/status* is also something that might be of value in the fashion industry for instance. Wearing a Prada bag instead of a bag bought at H&M might signal wealth. Other brand names signal other attributes (ecommerce-digest, n.d. ; Osterwalder & Pigneur, 2010).

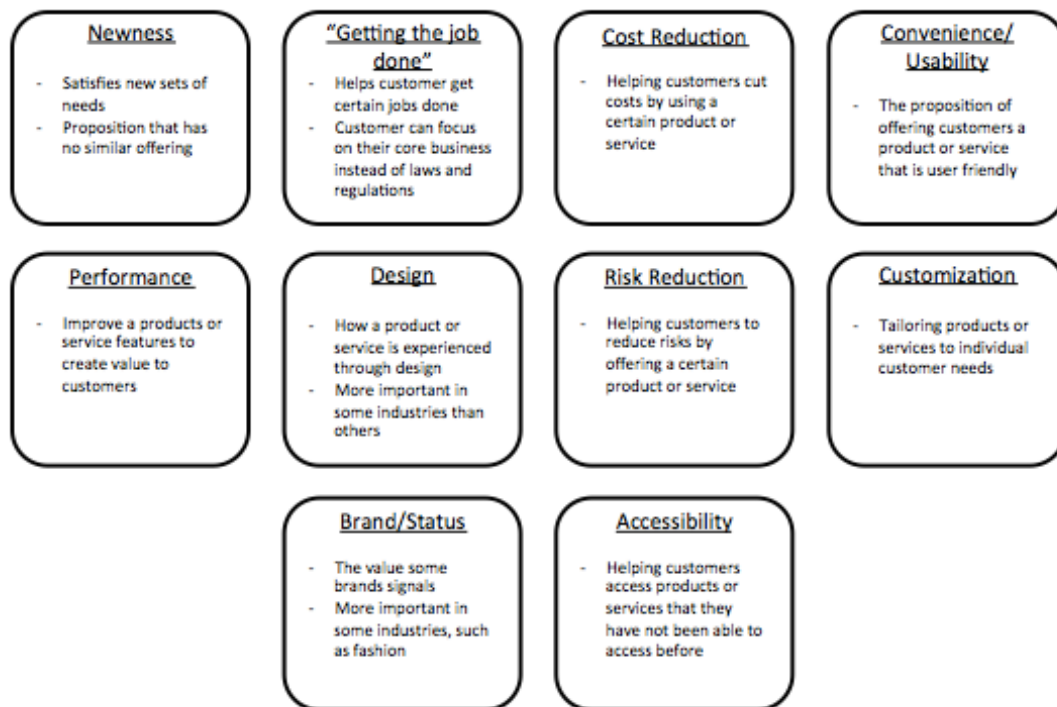
*Price* is the proposition of offering a similar value at a lower price than competitors. This is a way of satisfy the needs of price sensitive customer segments. Ryanair is an example of a business model that is built on the value proposition of satisfying price needs among customers (Osterwalder & Pigneur, 2010).

*Cost reduction* refers to helping customers reduce costs by the product or service.

*Risk reduction* is to offer the customers a reduced risk they incur when buying a product or service. One example is to offer a one-year service guarantee for a used car buyer. By doing so one reduces the risk of post-purchase breakdowns and repairs (Osterwalder & Pigneur, 2010).

*Accessibility* is about making a product or service accessible to customers that have lacked the access to the product or service before. Osterwalder & Pigneur (2010) explains that NetJets builds on this proposition. They popularized the concept of fractional private jet ownership. NetJets offers individuals and corporations access to private jets, a service previously unaffordable to most customers.

*Convenience/Usability* is the value of making the product or service as easy as possible for customers to use. A good example of this is Apple, who has designed their products built on user-friendliness (ecommerce-digest, n.d.).



**Figure 6.** *Value Propositions*

## 4 Envac Stakeholders

According to APM BoK (2012) stakeholders are the organizations or people who have an interest or role in a project, programme or portfolio, or are to some extent impacted by the aforementioned. Stakeholder management is the systematic identification, analysis, planning and implementation of actions designed to engage with stakeholders.

Paying attention to key stakeholder relationships (Freeman, 1999 in Alexander, Miesing & Parsons, n.d.) has been a major theme in the strategic management literature. This indicates that stakeholder management is not only about having a good relationship towards those with power and interest in projects; it is also about companies' strategic success (Alexander, Miesing & Parsons, n.d.). The ability an organization has to develop and maintain a strong relationship towards stakeholders increases the chance of a continued long-term relationship, it should therefore lie in companies' interests to maintain a good stakeholder relationship (Alexander, Miesing & Parsons, n.d.). This chapter contains the identified stakeholders of Envac Scandinavia AB in Gothenburg, also a brief description of the different stakeholders, and how the stakeholders are able to affect a project made by Envac - plotted in a power/interest grid.

### 4.1 Stakeholder Mapping

Following sections consists of the identified stakeholders of Envac. The identified stakeholders are shortly described in terms of their interest in projects carried out by Envac. A power/interest grid is furthermore presented in the end of this chapter.

#### 4.1.1 Stakeholder Identification

Internal	External
1. Envac Employees	3. Society
2. The Stena Sphere	4. Gothenburg Municipality
	5. Construction Companies
	6. The Traffic office
	7. The Traffic Committee
	8. The Environmental Administration
	9. The Head Architect of Gothenburg City

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10. End-users
11. Buyers (landowners, property owners)
12. The City Planning Office
13. District Administrations
14. Recycling and Water
15. Waste Sweden
16. Other waste entrepreneurs
17. Safe, Beautiful City
18. The Park- and Nature Management
19. The Environmental Protection Agency
20. The Real Estate Office

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**Figure 7.** A compilation of identified stakeholders affected by projects carried out by Envac

### 4.1.2 Stakeholder Description

1. *Envac Employees:* The employees at Envac are those who fulfill customer needs and expectations. The employees are stakeholders since they carry out the projects, from start to finish, and also carries out the maintenance of the systems. The system competence lies within the competence of the Envac employees. Their interest in the success of a project is mainly due to economical reasons. Envac pays their salary.

2. *The Stena Sphere:* The Stena Sphere is the owner company. They have 100% shares in the company and Envac's project success is accordingly 100% their concern.

3. *Society:* The society has the power to shape public opinion and to choose their decision makers. They have the power to create a demand for how they want their waste to be collected and handed in their city.

4. *Gothenburg Municipality:* Residents living in Gothenburg will definitely be affected by a project carried out by Envac. The heavy traffic caused by refuse lorries will decrease and the streets will not be as crowded as before. The fact that installing a mobile- or stationary Envac system means that some work in the streets needs to be done, digging down the pipes is vital for the systems. This will also affect the people living in the area.

5. *Construction Companies*: An Envac project will affect construction entrepreneurs either when new constructions are established or when the system is to be installed in old buildings. In new constructions, entrepreneurs will be affected in that sense that the pipelines must be planned according to other infrastructures. Ideally a member from Envac is involved in the planning phase.

6. *The Traffic office*: Is headed by The Traffic Committee in Gothenburg. Their responsibility is to carry out and realize the decisions made by The Traffic Committee. The Traffic office responsibility is to improve road safety and to reduce environmental disturbances. The Traffic office does not possess own resources to carry out work that has to be done; they hire a third party who is responsible for the execution (Goteborg.se, 2016).

7. *The Traffic Committee*: The Traffic Committee is responsible for two administration offices; The Traffic office and Transportation Service Management. The Traffic office is the one relevant administration office of these two for this report. Their responsibility is to improve road traffic safety and to reduce environmental disturbances, for people in the municipality of Gothenburg and for the urban environment (Goteborg.se, 2016).

8. *The Environmental Administration*: The Environmental Administration's mission is to ensure that the people of Gothenburg have the opportunity to have as good living environment as possible. Their task is also to decrease health and environmental impacts, so that the impacts are as small as possible. They are head of the environmental strategic processes (Goteborg.se, 2015).

9. *The Head Architect of Gothenburg City*: The current head architect of Gothenburg is Björn Siesjö. His task is to develop urban visions and act as a support for the planning and building departments (Gothenburgs Stad Byggnadsnämnden, 2009). He does not have the authority to decide what should be done, but act as a support and sets guidelines. The main responsibility is to create a dialogue between the departments of The City Planning Office, the building committee and the politicians, and create a common vision (Fahlgren, 2011). As for the current architect, Siesjö's vision is a greener Gothenburg acting as a collective living room to the residents living in the city.

10. *End-users*: Those living in households with the vacuum system are affected in that sense that they are the users; accordingly they are the ones that will encounter the benefits or the negative effects of the system.

11. *Buyers*: As been brought up earlier in this report, there has been a discussion of ownerships regarding vacuum systems, since the initial investment in many cases can be perceived as of larger-scale. The buyer of the system is in some cases the



municipality, and in others the landowners. Regardless owner, the buyers are the investors and their interest in a successful project is very high.

*12. The City Planning Office:* The City Planning Office's job is to constantly create a comprehensive plan for the city of Gothenburg. It is included in their responsibilities to decide how and where new buildings should be built and to make sure that the overall vision of Gothenburg is followed. They are for instance responsible for building permits (Goteborg.se, 2015). The head architect of Gothenburg is a part of this office (Goteborg.se, 2016).

*13. District Administrations:* District administrations are the administrations responsible for municipal services for those living in the concerned district (Goteborg.se, 2016).

*14. Recycling and Water:* Are a municipal administration responsible to create a sustainable society by offering the inhabitants efficient, safe and environmentally sound water supply and wastewater management. They are also responsible of offering efficient and environmentally friendly collection of waste so that it is collected safely and are able to be recycled or recovered (Goteborg.se, 2016).

*15. Waste Sweden:* Are the experts in the area of waste management and recycling (Avfallsverige.se, 2016). They are responsible for every municipalities waste management, and makes sure that the waste is recycled - environmentally friendly, safe and long-term sustainable. The vision of The Waste Sweden is: "There is no waste", meaning that they want to prevent the occurrence of waste. They also wish to re-use as much waste as possible and they want to recycle and dispose the waste that actually is produced in best possible way (Avfallsverige.se, 2016).

*16. Other Waste Entrepreneurs:* Such as Renova, which are responsible to collect waste from those using the traditional waste container collecting system. Refuse lorry drivers are for instance highly affected when a vacuum system is installed, since it decreases their job opportunities and duties. According to Envac employees, interviewee P6, and Renova.se (2016), Renova is a company owned to 85% by the municipality of Gothenburg. It is also owned by other municipalities around Gothenburg, which also utilizes Renova's services.

*17. Safe, Beautiful City:* Safe, Beautiful City is a cooperation organization between *Park- and Nature Management, The Traffic office* and *The City Planning Office* whose vision is to create a beautiful and safe Gothenburg city, a city where people can interact in a pleasant and safe urban environment. Together they work in project groups and organize events such as "cleaning campaign's" to fulfill their vision of a pleasant urban environment (Goteborg.se, 2015).

18. *Park- and Nature Management*: Are responsible for Gothenburg’s outside environments. They manage for instance parks, playgrounds, trees, public toilets, sculptures, lakes and rivers in the area of Gothenburg. They also maintain and rehabilitate roads, bridges and parks and execute and coordinate winter maintenance, road sweeping and park management (Goteborg.se, 2015).

19. *Environmental Protection Agency*: Environmental Protection Agency’s main concerns are those related to the environment. Issues that they concern about are the state of the environment, water issues, issues related to the air and climate, waste management, biodiversity, and how people are affected by the living standards of today, such as by noise for instance (Naturvårdsverket, 2016).

20. *Real Estate Office*: The Real Estate Office operates mainly in four different areas: as landowners, in exploitation and development, maintenance and accommodation. Their mission is to create good opportunities and prerequisites for people who lives, or want to live, in Gothenburg, but also to support businesses through the assistance and offering of land to industries, commercial businesses and education/science etc. (Goteborg.se, 2015).

### 4.1.3 Power/Interest grid

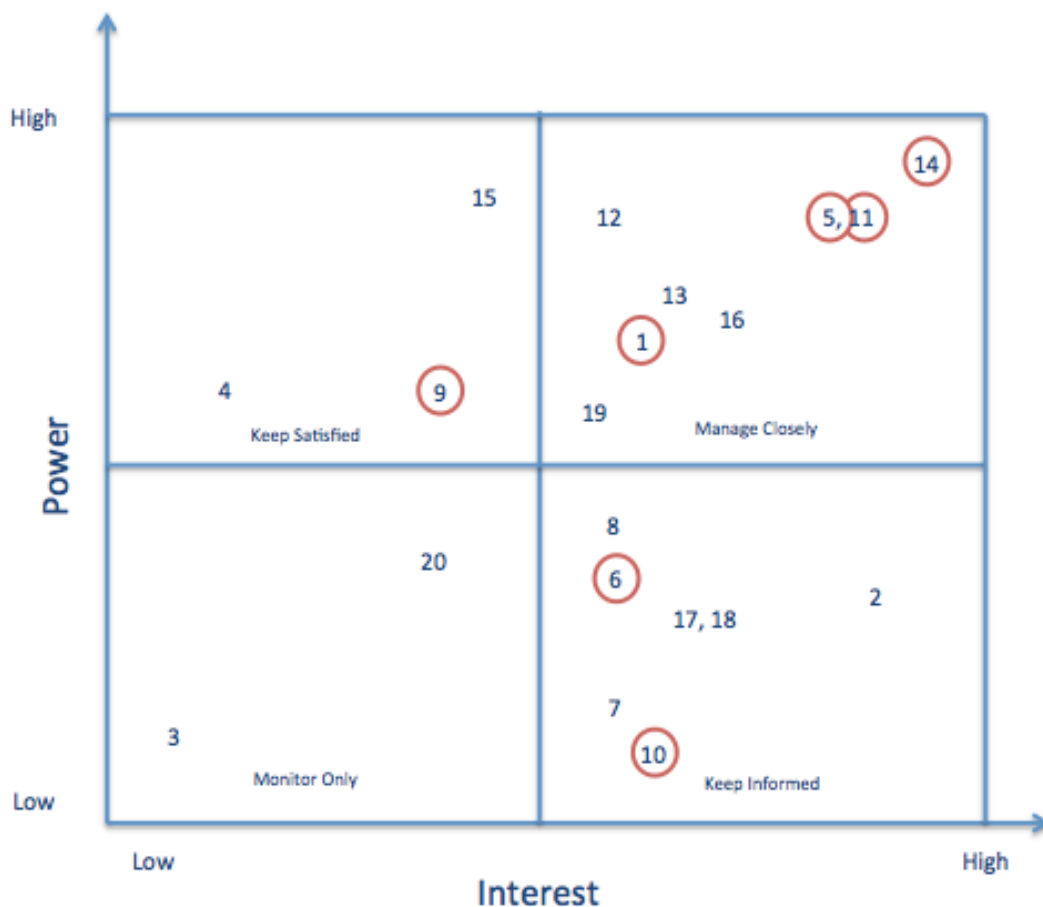


Figure 8. Power/Interest grid

Figure 8 above shows a plotted power/interest grid done in collaboration with Envac. The numbers in the grid represents the numbers the stakeholders has been assigned in previous sub chapter. According to Tonnquist (2008) correct stakeholder management during the execution of the project as well as after the project has been executed is one of the most important components of a successful project outcome. As can be seen in the grid stakeholders with high interest respectively high power in a project conducted by Envac has to be managed closely. Those stakeholders which has high interest but comparatively low power has to be kept informed about the projects proceedings. Stakeholders with low interest as well as low power has to be monitored only. They are not given as much effort as other stakeholders are. Those stakeholders with high power, but with relatively low interest are those stakeholders that have to be kept satisfied.

The stakeholders chosen for this report is the stakeholders plotted and marked as number 1, 5, 6, 9, 10, 11 respectively 14. Some of the stakeholders belongs to the same stakeholder group as been stated to be the focus for this report, namely the *users*, *the developers*, *the construction companies* and *the authorities*. The plotted number 1 belongs to the developers. Number 5 as well as number 11 belongs to the construction companies, since number 11 sometimes also was representatives' from construction companies which owned the facilities. Number 6, 9 and 14 was representatives from the authorities and number 10 represents the users.

Other stakeholders were also contacted, but they however referred to Recycling and Water, which further already had been interviewed.

## 5 Results

This chapter contains the results of the interviews conducted. The results will further be presented according to area of interview, the sub chapters also contains the identification of stakeholders' needs and the problems with the different systems identified through stakeholder interviews as well as value element findings. The needs and problems are in line with what APM BoK describes as an outcome of the benefits of the identification of value, it will also serve as a basis for making value propositions in the analysis. Further, as stated in the chapter about value management, it is important to not leave out elements that make the next best alternative to look more beneficial. That is, the alternative to purchase the traditional system to the disadvantageous to Envac. Some value elements are therefore in favor for the traditional system, some in favor for the vacuum system and accordingly, some are in favor for the optical sorting system. The last sub chapter contains tables summarizing the customer pains and gains with the three different systems, seen from the stakeholders' perspectives. The information given in this chapter serves as a basis and foundation to the value propositions that are made in the next chapter, which are focusing on the propositions Envac are able to propose to their stakeholders and customers.

### 5.1 Construction Companies

The results of the interviews generated in many identified value elements. As for the construction companies it has been different opinions with regards to value for the different disposal systems. Following is the identified needs, problems and value elements from the construction companies' viewpoints identified through the interviews with the interviewees P1, P2, P3 and P6.

#### 5.1.1 Needs

These are the needs identified for the construction companies.

##### Conditions at site

The needs for construction companies as disposal system stakeholders are many, and depending on situation it differs as well. P3 especially highlighted that the conditions at construction site are the most relevant aspect when it comes to deciding which waste disposal system to purchase, P1 and P6 agreed to this matter. P1 further explained that this is mainly due to the fact that the vacuum system requires digging; which has to be possible at site.

##### Economical system

The conditions along with price are the elements every interviewee (P1, P2, P3 and P6) answered to be of significant matter when making decisions. The disposal system should be an economical system. That is, that the system is not too expensive when it

comes to both the initial investment as well as operating costs. The initial investment is furthermore of great importance in some projects, and since the vacuum system requires a high initial investment it is not to prefer when this requirement is to be met. P1 and P3 states that sometimes, with regards to budget, they have to choose between quality and cost. If it is a tight project budget, the quality might suffer and one chose to cut costs. In this case it means that one has to choose a traditional system, since it requires less investment compared to the vacuum system as well as the optical sorting system.

#### System's reliability

It has been shown that the views on the vacuum system are of very differing opinions. P1 for instance claims that Envac's systems are not reliable and has a lot of downtime which is the main issue with the systems. The other interviewee's (P2, P3 and P6) however states that the vacuum system is a reliable system that operates safely. Whatever argument the interviewees had, if reliable or not, the need for a reliable system is agreed upon by all of the interviewee's, regardless type of disposal system.

#### Fulfilling laws and regulations

The need for a system that fulfills laws and regulations are also of significant matter, since there are restrictions to follow for construction companies. Interviewee's states that it has become more and more important, and people as well as the society and government are pushing for better recycling opportunities in housings. The system accordingly needs to fulfill these requirements that are set. One interviewee (P3) also states that the employer company is certified and always constructs constructions according to the so-called Svanen label. Some criteria have to be met if working according to Svanen, so the system they purchase has to fulfill these criteria. This need goes to some extent hand-in-hand with another identified need of a system being environmental friendly. The Svanen label is about construct environmental friendly and sustainable buildings. Again related to these two needs is the need P1 states of being able to collect as many fractions as possible, partly because of one being able to offer property close collection, but also to keep the fractions collected as clean as possible and accordingly also keeping the area clean. This also follows the set laws and regulations. Furthermore there is a guiding distance set from authorities to be maximum 50 meters to closest inlet; the system chosen should therefore be flexible in order to meet this demand (P1, P3, P6).

P3 also emphasizes that the system that is chosen for a project must be compatible logistic-wise. This is a criterion mostly applicable for the traditional system, and to some extent to the optical sorting if having a traditional system in combination with the optical sorting system. The construction of the building must be planned according to refuse lorries and their ability drive in the area. Other needs identified related to the traffic is that interviewee's see value in the ability to reduce heavy traffic in an area. They want to avoid or reduce heavy traffic as much as possible, both

for the sake of resident's safety, but also to add value to the ones living in the area since the neighborhood is perceived as more pleasant without traffic according to P6.

#### Add value to end-users

The system should also offer the end-users the ability to sort their waste from start, everything at the same location. The construction companies that build and further owns the facility is also very concerned with user-friendliness. It should be easy to recycle. The ability to see the waste is also identified as a need, and accordingly a benefit with the traditional system. Interviewee's argues that if being able to see what fractions that have been thrown makes the user more aware of the consequences of sorting errors. Also, some people might discover waste belonging to another fraction and picks it up and corrects the mistake. The ability to correct mistakes is mentioned as a benefit in favor for the traditional system. When throwing waste down an inlet of a vacuum system there is no turning back since the waste that is thrown disappears down underground and can accordingly not be corrected. Many of the interviewee's (P1, P3, P6) therefore is of that opinion that making the waste visible for others to see is beneficial. Other values that refer to end-users are that the construction companies always seek opportunities to add value to residents (P6). If being able to doing so by choosing a disposal system that adds value to the end-users, then they want to choose the value-adding solution. Adding value to residents is also the ability to offer them pleasant environments in the neighborhood, states several of the interviewee's. As underlined by P6 construction companies therefore seems to seek to design a project so that the neighborhood has a nice environment, preferably also with green areas.

#### Supplier relationship

One of the needs that only are applicable for companies such as Envac is the need for construction companies to establish a good relationship to supplier. If using the traditional system the relationship is not as important as it is to the company supplying the vacuum system, according to P2, since the supplier is not involved to the same extent in the design phase of a project as well as the maintenance of the system for the traditional system. The need of having a good relationship to Envac as a supplier of the vacuum system as well as the optical sorting system is therefore of great value to construction companies which are using their products and services. Another aspect related to relationship to supplier is also the need of them doing their part of the collaboration. Meaning that they take responsibility for their part, collecting waste when it is needed, correct problems if they occur, and are reliable. Also applicable to Envac is the benefit P2 emphasizes of Envac being a part of the designing process in the planning phase of a project, the system is accordingly planned to maximize its abilities if Envac is involved.

## 5.1.2 Problems

These are the problems with the different systems, stated in the interviews, from construction companies' viewpoints.

### Optical sorting

The problems with the different systems are different, according to the interviewee's representing the construction companies. P1 underline that one problem regarding the optical sorting system is the lack of knowledge about the system. There is not an established optical sorting facility in the area of Gothenburg that support this kind of system, therefore it is not very well known to people in general. If investing in such a system the construction companies would be forced to conduct major information campaigns to residents, which could be an issue since it requires more effort and will be time consuming (P1 and P2). P1 claims that the system also implies a greater effort amongst residents and the colored bags needs to be sorted properly. It also requires space in households. In order to being able to sort in this amount of different colored bags one accordingly also requires the same amount of different bins, which might be space consuming in households (P2). The optical sorting gets further criticism from P1 due to the lack of end-users ability to sort properly, all the responsibility lies at the end-users and P1 does not believe that the end-users in the end do not care about recycling.

### Vacuum system

P1 believe that the vacuum system is disadvantageous since the system does not allow people to see the consequences of the thrown waste. It is not an "open" system such as the traditional system and people cannot take back what has been thrown. Criticism is also directed to Envac of being in a monopoly position from all of the interviewees. They can accordingly sell their products and services to any price, since once one have invested in a vacuum system one are accordingly dependent of the operations of the system. Another difficulty regarding the vacuum system is that it is more technical difficult to build. The mobile vacuum system requires to be built on top of each other, on two floors, for instance. P3 however states that this is a minor issue since the construction companies has the ability and the resources to accomplish this. P3 further states that these systems often have a good design and requires little space.

### Traditional system

Problems related to the traditional system are that heavy traffic is needed close to the living area, meaning that the traffic situation is not as safe as it would have been if using a vacuum system (P6). P2 and P3 also highlight the fact that the traditional system also equals less utilized floor space. That is, space that could have been used as a source of income instead. The traditional system has furthermore not the same allowance to plan for green areas to the same extent. If using a vacuum system one moves traffic from the living areas and one are able to utilize the outdoor space more wisely in that sense. This is a way of adding value to residents according to P6.

### 5.1.3 Identified Value Elements

This is a summary of Value Elements that the interviews at the construction companies generated. The identified values below are important aspects to a company when deciding disposal system in a project.

Value Elements Construction Companies
That it is an economical system
That the system is reliable
Fulfills laws and regulations
That the system is cheap to build
Low operation cost
User friendly
Chose between quality versus costs
Environmental friendly
The ability to collect as many fractions as possible
The business relationship to supplier
That the supplier manages its part in the collaboration
Keep the distance to closest inlet to maximum 50 meters
The ability to "see" the waste
Initial investment
Long-term solution
The ability to offer property close collection to end-users
The ability for end-users to sort their waste at the same location
The ability to adapt to conditions at site
Meet logistic demands
Add value to residents
Reduce heavy traffic
The ability to offer pleasant environments to residents
Low maintenance cost

## 5.2 Authorities

This chapter is built on the same principles as previous. The needs, problems and value elements with regards to the authorities are presented. The interviewee's P4 and P7 represented the authorities Recycling and Water respectively The Traffic office. Note that other authority offices also were reached out to, however they were prevented to participate in this research due to several reasons.



### 5.2.1 Needs

These are the identified needs for the authorities.

#### Working environment

P4 as well as P7 states that both divisions they represents are concerned with working environment for refuse lorry drivers. The system that is chosen for a housing therefore has to fulfill some criteria related to working environment, the waste collector should not have to drag the waste containers long distances for instance. The roads in the area should therefore be planned and designed in that way so that the refuse lorry driver is able to drive smoothly in the area. That is, if working with a traditional disposal system. If working with a vacuum system one only has to design and plan the area around the waste collection facility according to vehicles abilities to turn around. One example of this need is a statement from one Movac refuse lorry driver, who also is a former traditional waste collector refuse lorry driver. The driver stated that the vacuum system is to prefer when it comes to working conditions. The body is not exposed to the same amount of heavy lifting and the work is not as toilsome as the traditional collection system. The Envac system ultimately reduces hazardous working conditions for the waste collectors. This statement is agreed upon from the municipal authorities Recycling and Water and The Traffic office. P4 argues that this fact is the biggest advantage with the vacuum technique when it comes to values. Accordingly, when it comes to the working environment the value of the vacuum system is superior the traditional system for those working in the waste collecting industry, and this is a great opportunity to emphasize.

#### Fulfills laws and regulations

As well as fulfill the needs of restrictions for refuse lorry drivers, other restrictions, regulations and laws have to be fulfilled as well. The chosen system has to be a system that meets all requirements set. As of today, the authorities has the responsibility to collect food waste as well as general waste, but this might change in the future and the authorities might be responsible to collect all fractions. The system then has to have the ability to collect as many fractions as possible. It has to be a comprehensive system.

#### User friendly and property close

One need that P4 states is that it is important that the system has the ability to take care of the waste, from when it is produced, until it is recycled. It should be easy for end-users to recycle and this is very important for the authorities. Ultimate for a system is that it is property close. P4 states that if the system is property close, people tend to be more satisfied than if not having property close collection. Property close collection is further one thing that P4 emphasizes as the most important aspect when it comes to recycling and disposal systems. There should be abilities to sort from starting point, and people should not have to throw their waste at different locations. The need, from the authorities perspectives, is that people are satisfied with their

ability to recycle. P4 also states that Recycling and Water's vision is to increase the sorting among residents and to reduce the amount of generated waste. The system therefore has to offer a solution to this vision.

#### Innovative system

P4 states that it might be relevant in the future to be able to weigh the waste on an individual basis in order to decrease amounts of waste generated. The demand of having such a system is increasing, and this might as well become relevant in Gothenburg for future purposes. The system therefore has to have the possibility to adapt to these demands, it accordingly has to be innovative.

#### Fit to urban development

P7 further states that there also is a need for a system that allows the city to grow. There is a huge urban development prevailing in Gothenburg, and the city is being densified in a fast pace. The system chosen for these areas needs to facilitate the densification and allow for narrower streets and buildings to be built.

### **5.2.2 Problems**

These are the problems related to the different systems with regards to the perspective of the authorities.

#### Optical sorting

Problems with the optical sorting system, according to P4, is that the optical sorting facilities have problems with sorting out the plastic bags when arriving at the facility. The equipment cannot handle the plastic and employees have to clean the equipment from plastic frequently. Accordingly it becomes a hazardous working environment. Another problem that P4 states is that the fractions becomes polluted and many bags are therefore rejected because of the amount of plastic that is mixed with other fractions, due to the plastic bags. The idea of adding waste to collect waste is not optimal according to P4, especially since EU has restrictions of decreasing the amount of plastic circulating today. Further, P4 states that one adds an extra step of the sorting process by using the optical sorting system – the bags is first being sorted out, and then demolished, in comparison to the traditional system where the sorting is made directly, and collected with regards to fraction. The fact that there is no existing optical sorting facility in the area also makes this system hard to implement in the Gothenburg area. P4 also thinks that it perhaps will be confusing for the residents with an additional system and its features to keep track of.

#### Vacuum system

After mail correspondence with the head architect of Gothenburg, the architect states that the vacuum technique, with a stationary- or mobile system, is a solution to decrease heavy traffic in the city of Gothenburg and will accordingly contribute to a safer city environment. He (ibid) however emphasizes that the initial investment is

problematic, since it requires such large amount of money compared to traditional systems, and states that it is the reason why it is not implemented to a greater extent in the city today. Consequently, the problem about the initial investment stated by the construction companies is also agreed upon from the head architect of Gothenburg.

P4 direct criticism towards the vacuum system as well as the optical sorting system, the opposite applies for P7, who sees almost only beneficial elements in the aforementioned. P4 states that neither the vacuum system nor the optical sorting system is a comprehensive system, one has to have another additional system to fulfill requirements of how many fractions to collect. The residents often have to sort their waste on different locations, and from a recycling perspective this is not beneficial. The fact that it is not an open system is also a problem, according to P4. People want to see their waste, and they want to be able to correct mistakes. P4 also claims that sorting errors tend to be greater when using vacuum systems.

#### Traditional system

The problems Recycling and Water sees with the traditional system is that it is a system not to prefer, working environmental-wise. Some waste containers are very heavy, and put a lot of effort on the collector. They are very exposed to, and affected by, injuries. There might also be difficulties finding spots for the refuse lorry close to the property and the drivers are sometimes forced to drag the containers long distances. The drivers should avoid reversing with the lorries, it is not safe for pedestrians and children since there have been accidents with deadly outcome related to reversing refuse lorries. P7 also emphasize that collecting waste traditional means a greater need for manpower, and manpower equals money. The system is not effective from that perspective, it is not a system designed to fit the modern society.

### 5.2.3 Identified Value Elements

The table below represents the important aspects from the authorities viewpoint when reviewing floor plans in building permits. The identified Value Elements are from the interviews conducted with Recycling and Water's representative P4, as well as The Traffic office's representative P7.

Value Elements

Authorities
The ability to take care of the waste, from when it is produced to the point where it has to be taken care of
That laws and regulations is followed
To ease the workload for waste collectors
Easy accessible roads to collection point
Working environment for waste collectors
That it is a comprehensive system and has the ability to sort as many fractions as possible
Property close collection
Increased sorting and reduced amounts of waste
That the residents are satisfied
The ability to become a weight based system, so that eventually being able to reduce the amount of waste
A system that suits the densifying of the city

## 5.3 Users

The needs, problems and value elements identified from the users viewpoints are presented below. It follows the same structure as previous sub chapter has been presented.

### 5.3.1 Needs

These are the needs identified from the users perspectives.

#### User friendly

The needs for users are mostly of user friendliness character, but also the ability to sort as many fractions as possible from starting point are mentioned as value adding. P5 as well as P8 emphasizes that it should be easy for the users to throw waste. It seems like end-users appreciate and has a need for property close collection because of the fact that it is easy. Further, P5 mentions that for them, in the board of the

community, it is of great value to make people sort their food waste as much as possible as well as papers to a high extent, since those fractions are not as expensive as general waste. The fraction for papers is even an income instead of a cost, since they can sell the fraction to paper mills. The ability to invite residents to a recycling behavior is therefore a need when it comes to the disposal systems in the perspective of those in charge of the economy in housings, as well as for the users.

#### Operational safety

P5 states that one of the biggest needs is that one can rely on that the waste is taken care of properly when thrown. Therefore it is of great importance to have a good collaboration and trust to those collecting the waste. The system should accordingly be reliable, meaning that the users are of that opinion that the chosen system does its job as it should be done and one can rely on its operational safety.

#### Pleasant neighborhoods

Residents also want a pleasant neighborhood, with many green areas where they can enjoy living, without being reminded of waste. Another appreciated aspect is to avoid attracting pests into the area as much as possible. If fulfilling this, one also gets a more hygienic system, which interviewee's states is a need. Resident does not want to see their wastes, and think that it is unpleasant. Waste causes odor and the odor is not a desired aspect from the users viewpoints. Another need is that the neighborhood is designed after the people living there; that they have a pleasant area to utilize in whatever way they want. The area should not be designed according to other needs, refuse lorries driving paths or where a recycling facility fits for instance.

#### Reduced heavy traffic

In areas consisting of many family households the reduction of heavy traffic is favorable, but the traffic safety is not only to prefer for families, many residents appreciate an area freed from heavy traffic. Also when looking at the pollution aspect, end-users tends to think that the area becomes more enjoyable without the pollution heavy traffic might cause.

*“In the society today the urban area keeps developing, and urban planners densifies the cities, yet families of today take greater amount of space than they did back in the days. Consequently there have become fewer people on larger amount of space. If the cities keeps on developing in this pace, and the cities becomes denser, it also have to be solutions to not cutting down on value adding elements that people in general values in their neighborhoods. Such as green areas, a high level of service and pleasant environment with reduced traffic and safe streets. The answer to this equation is the vacuum system, in order to fulfill every criterion set from every part involved”. (P5)*

### 5.3.2 Problems

These are the problems related to the different systems with regards to the users viewpoint.

#### Optical sorting

The optical sorting system is not getting criticism to a high extent during the interviews. This might be because the users lack information about the system. One problem that P5 however highlights is a problem regarding authorities when it comes to the optical sorting system. The community P5 represents has had the question of including optical sorting bags in the vacuum system they already possess to Recycling and Water, but the authorities rejected the proposal. Recycling and Water were not interested in taking care of the colored bags since there is not an optical sorting facility established in the Gothenburg area. The decision was however not very upsetting to the community since they are happy with the vacuum system today, but P5 emphasizes that Recycling and Water are hard to have a dialogue with.

#### Vacuum system

P5, who are not only a user but also a resident voluntarily in charge of questions regarding the vacuum system in the neighborhood, hears a lot of reactions from people when it comes to the disposal system and experience some by self. The problem that P5 states is that the authorities in Gothenburg has too high taxes for those with the vacuum system as a disposal system. If comparing to other municipalities, such as Stockholm, the rates in Gothenburg are much higher. P5 is of that opinion that due to the fact that the municipalities avoid workload in this area, since refuse lorries are not needed to the same extent compared to a traditional system, they should not be charged these high taxes. This is however not the case. Another problem related to the vacuum system and the collection of the waste is that the waste collectors have not been doing their job. The waste collectors is not Envac, it is another supplier who picks up the waste, and they have been rejecting P5's community's food waste several times and the community have had to pay extra for this. The rejections were investigated and the community won and got indemnity for the wrongly rejected food waste charges. P5 therefore states that due to this they have trust issues and do not rely on the waste collectors anymore. They are however very satisfied with Envac which they have a close relationship towards.

#### Traditional system

P8 states that the ability to sort as many fractions as possible, from start, is a great way to invite people to recycle, and P8 appreciate property close collection. The problem is that P8 lives in a housing with the traditional system and is of that opinion that it is not a hygienic system. The odor is a problem; one does not want to visit the garbage room if it is not required. P8 also states that it is not appreciated to see others wastes, and would prefer not to see it, especially if one can avoid the smell as well. In

P8's garbage room there is a lot of pests and if there is a solution to avoid appearance of pests it is favorable.

### 5.3.3 Identified Value Elements

This list is accordingly from the interviews and interactions conducted with users of the vacuum system as well as the traditional system. The list is important aspects from users points of views, regardless disposal system. The identified value elements are a summary of the conducted interviews, but some elements are also from the interactions made with residents living in areas with vacuum systems.

Value Elements

Users
The ability to sort as many fractions as possible
Generate as little general waste as possible, important to be able to sort food waste and papers as much as possible
Pleasant neighborhood
Green areas
That the neighborhood is safe from heavy traffic
Environmental aspect, less pollution
No pests in the area
Reliable system
When the waste is thrown it is taken care of
That the neighborhood is designed according to people living there
User friendly
That the suppliers are reliable and do their job
Property close collection
That every fraction can be thrown from starting point
Hygienic system
Odorless

## 5.4 Developers

Two interviewees, P8 and P9, and many interactions and observations have been made with the developers of the vacuum system as well as the optical sorting system. This sub chapter contains the identified needs, problems and value elements from the developer's point of view. This sub chapter follows the same structure as previous sub chapters have been structured.

### 5.4.1 Needs

These are the needs identified for the developers.

#### Know the systems features

For those developing and selling the products and services of Envac the needs look slightly different. P8 states that it is important for employees to know the system and its features to a higher extent. Those working at the administration department, for instance, are not very familiar with the systems that the company offers. The need for communicating this to a higher extent is therefore of value to the company.

#### Economical growth

Another need is that the company develops and keeps growing. By doing so current employees are able to continue working for the company and new employees can be employed. Economical growth is important for every company's future existence; this is therefore a need that lies in every employee's interest. P9 further states that there are 6 million users of the products of Envac today. There are 7 billion inhabitants on this planet. Envac accordingly covers less than one per thousand of the market. The market potential is therefore huge for the product in the future, and the ability to claim market shares seems to be achievable to the developers.

#### Customer interactions

P9 emphasizes that the interaction with customer is of great importance in order to strengthen the brand and to become well known. This need has been an important aspect and they have been working hard to achieve this. P9 states that Envac is a company that is well known by the Swedish government due to the close interactions with customers and stakeholders, and P9 explains that they intend to continue in that direction. A company such as Envac is dependent on communicating their products and services since there already is an established and, to some extent, a well functioning system existing in waste management contexts, namely the traditional system. It is accordingly important to gain knowledge and understand "soft-values" of customers. The values that are not only countable in money- or technical terms, P9 states that the understanding of stakeholder values therefore is of significant matter to the company in order to understand the demand of the market.

#### Product development

There is also a need of developing a product that fits with the environmental aspects that are becoming more important today than ever before. The products need to build on technical intelligence to keep the pace of the market development since this might be of significant matter in the future. According to P9 SMART cities are growing, meaning cities that have taken on a "green" approach. The approach is a name consisting of the urge to be as cost efficient, environmental friendly, and energy efficient as possible. The trend is significant. One thing that is in the interest of the SMART approach is a service Envac can offer, namely by installing a weight based



throwing system called Pay-as-you-throw (PAYT). The idea is to weigh the waste every time it is thrown down an Envac inlet, the people throwing accordingly pays for the amount waste thrown away. Envac's systems and techniques is optimal for this kind of system, one can easily add an automated scanner, scanning who is throwing the waste through tags or keys used to open the inlets. If doing so on every traditional system existing, which lack the technical intelligence, would be costly. This is in favor for Envac.

#### Create mutual vision among stakeholders

It is also of importance to strive to create a mutual vision among customers and stakeholders. There is a need to get individual decision-makers to see the entire picture when building and designing areas. If building one area with the vacuum system, another area can easily connect to the vacuum pipelines; accordingly people work together to reduce traffic, pollution and create a safer community.

#### Reliable system

Further, Envac Scandinavia's CEO made a customer survey about stakeholder values. The survey contained a blank page where customers were allowed to write what they thought was Envac's strengths as a company (or their systems strengths). The most frequent used word was that their system is reliable. This aspect is very valuable to the developers - that their customers are able to trust and rely on Envac as a company, but also the systems they offer.

### **5.4.2 Problems**

These are the problems related to the viewpoint of the developers. The problems of this section are focusing on problems that Envac might encounter if not being prepared for it, i.e. risks.

One risk that P9 have identified is that Envac's solutions do not get a stronger foothold on the market. That the efforts do not succeed. Another problem might be that the market develops in a way not foreseen or prepared for. Technical development might also be developed in a pace that Envac cannot manage. Strategically actions to reduce this risk are not to become sedentary, the company needs to be prepared and develop in the same pace.

Other problems, or risks, might be to not being able to reach out to those with a negative attitude towards the vacuum system as well as the optical sorting system. There is a need to change mindset and also to distribute accurate information regarding the systems and data about the benefits of the systems. Data regarding reduced costs, but also data on "soft-values" showing customer satisfaction have to be distributed. P9 explains that such data exists, conducted in Spain, showing that approximately 92 %-95 % out of 300 end-users were satisfied with the system. However, this research needs to be done by unbiased actors, and not by Envac

themselves. The studies are not reliable to the same extent when Envac accounts for the research, if the result is in favor for the company.

### 5.4.3 Identified Value Elements

The list below is a summary of the value elements identified for the developers.

Value Elements	
Developers	
Important to know the systems features	
That the company develops	
Economical growth	
Interact with customers	
Products and services fit with the environmental aspects that are becoming more important today	
Get individual decision-makers to see the "whole picture"	
Investigate stakeholder values, in order to understand demands	
Understand "soft-values" to a higher extent, not only technical or economical stakeholder values	
That there is a big potential market that makes it possible to keep exploit and expand	
That the product and service builds on technical intelligence, in line with the market development	

## 5.5 Pains and Gains

Following is a summary of the pains and gains with the different systems. They were identified through the interviews conducted with the stakeholders. The pains and gains are presented as summaries in tables, one table for the vacuum system, one for the traditional system, and one for the optical sorting system. The pains and gains have been summarized in tables that correspond to answers from every stakeholder interviewed. These tables can be read on the next couple of pages.

### Vacuum System

Gains	Pains
The ability to locate inlets outside facility and accordingly save space	Envac in monopoly position
Reduce heavy traffic	Expensive maintenance cost
Expensive to replace pipelines	Residents/end-users does not follow restrictions of how to throw
Envac is the best supplier	Waste gets stuck in the pipes, accordingly it gets messy outside the inlets
The ability to place the vacuum facility outside the urban area	Same amount of space is required in the building as the traditional system
Refuse lorries are not needed as frequent compared to the traditional system	Mobile system requires two rooms on top of each other
Avoid noise and smell	Inlets outside buildings: a question of esthetics
Convenient for end-users	Inlets outside buildings: if stop in pipeline, waste gets thrown on the streets
Minimizes risk of pests in the area	People does not take responsibility for waste that cannot be "seen", disappears in the ground
Increased traffic safety due to the reduced heavy traffic	Not an "open system"
Interviewee's gets rarely negative feedback from residents regarding the vacuum system	Frequent operational problems
A more luxurious system compared to the traditional	If businesses are not allowed to throw waste in the inlets, heavy traffic is ultimately required anyway
Working environmental-wise best for refuse lorry drivers	Loud noise
Possibility to densify the city	The smell
The ability to utilize floor space to other purposes	More technical complicated to construct
Not as many employees is required	More information is required, since people are not allowed to throw garbage down the same inlets
Pipeline-downtime is sorted out quickly	Initial investment
One does not see the waste and do not need to reflect over the waste when thrown	Risk of sorting errors, since people cannot correct mistakes
The ability to design an area according to people/green areas, not according to refuse lorries ability to drive	Not a comprehensive system
	Not able to collect fractions for glass
	The sorting location might be located on different locations
	Employment opportunities is decreased
	The municipal rates for the vacuum system
	Comparatively tougher policy's for vacuum system in Gothenburg than it is in Stockholm for instance
	Information to end-users is inadequate

Traditional System

Gains	Pains
The ability to chose from a number of suppliers	Have to be maintained, otherwise it will be messy
Greater market competition	The more fractions required, the more space is required
The ability to see the waste and what is thrown	Roads have to be planned according to the refuse lorries ability to reverse, requires space outside
Easier to correct mistake	Heavy traffic is required in areas close to the facilities
Cheaper investment	Floor space is not utilized to better purposes
Not as technical difficult to build compared to the vacuum system	More employee management is required
Flexible system, ability to add or remove waste containers if needed	More refuse lorries is required
Are not dependent on a supplier/not a system that is "built-in" in the design	Odor
Tend to be more proper recycled fractions compared to the traditional system	Risk of pests in the area
"Open system"/ability to see the waste	People tend to throw things that are not meant to be thrown in the containers
	Not a closed system
	Requires frequent emptying of waste containers
	Heavy working environment for refuse lorry drivers
	Refuse lorry drivers might be forced to drive in unsafe areas
	A garbage room is often seen as "boring" rooms
	There is no choice but using Renova as suppliers, since Recycling and Water have procured their services

### Optical Sorting

Gains	Pains
The ability of being able to sort from starting point	End-user might not be capable to sort
Fulfills property close collection	Too much responsible on end-users
Does not require a great amount of commitment by the end-users (does not have to get to a recycling facility)	Requires excess information to residents
Beneficial for hospital environments	Initial investment
Does not require as much space in a facility	Gothenburg authorities wants the food waste in paper bags
A good alternative in a neighborhood consisting of houses, or an area not so <u>densified</u> where it might be too expensive to invest in a vacuum system	Difficulties with remove the plastic bags from the different fractions in the optical sorting facilities
	Too much waste in the food waste when removing the plastic
	Plastic gets in the food waste and cannot be used
	Hazardous working environment on the facilities
	EU has decided to reduce the consumption of plastic bags. 40 bags per person, per year
	Adds circulation of plastic, not in line with EU regulations
	Adds waste to manage waste (plastic bags)
	Not an existing optical sorting facility on the Swedish west coast, have to transport the waste to such a facility in that case
	Adds one step of sorting
	Those collecting metal want to collect metal, not metal in a plastic bag
	Great information campaigns is required if it is introduced in Gothenburg
	"Gothenburg will not be the same if introducing the system"
	Might be confusing for the end-users with many different systems
	Communication problems might occur (people contacting the authorities to get information, information that the authorities might not possess)
	Cardboard might be hard to throw in a plastic bag, since one often have big sized cardboard. End-users have to go to recycling facilities either way
	Have to compensate with an additional system to cover every fractions that are to be collected

## 6 Analysis

This chapter contains an analysis of the results given from the interviews. The proposition opportunities found during the interviews have been translated into value propositions Envac are able to offer their customers. The value propositions are in line with the stakeholder needs identified in the results. Further, some needs have been identified to fit into value dimensions, and a sub chapter about value dimensions is therefore also presented.

### 6.1 Making a Value Proposition

By analyzing the stakeholders' needs, problems and pains and gains given from the results there have been an ability to make value propositions. These propositions are the pain relievers and gain creators Envac are able to offer their customers. The value propositions are valid for the construction companies (as customers), for the authorities (as influencers) and for the end-users (also as influencers).

#### The proposition of *Newness*

By using Envac products one are accordingly becoming more environmental friendly. This is due to the fact that Envac has a system to offer which generates less pollution from heavy traffic, it also reduces the amount of heavy traffic, and it is a long-term sustainable solution since installed systems run for a long period of time. Also the fact that it is a product and service that fit with the environmental aspects that are becoming more important today is an aspect that is in line with the development in the industry. The product builds on technical intelligence, which is not the case for other disposal systems, in line with the market development. Cities are able to become more "smart" in that sense. Envac offers the ability to become a weight based system, so that one eventually can be able to reduce the amount of waste. The fact that Envac's systems also has the ability to ease the workload for the waste collectors are another thing that Envac can benefit from, since no other system but the vacuum system can offer this, and this is a big concern for the authorities in the city. Furthermore, the The Environmental Administration are not planning to establish new areas where one can install recycling facilities for people to throw the waste they are not able to throw in their housings. Property close collection is therefore the most important aspect when choosing disposal system today. The ability to facilitate the sorting process for end-users is of significant matter, since research has shown that the easier it is for people to sort their waste the more likely it is that they do it. As mentioned before, P4 stated on the interview that optical sorting enables property close collection; this fact is a positive aspect to Envac since Envac already has solutions to facilitate property close collection. A combination between the optical sorting system, with different colored bags, along with the vacuum system will allow for property close collection, but also allows the ability to densify the city. As far as the author can see, this is the ultimate solution with regards to disposal systems in order to offer everything that the

authorities ask for and values. Another aspect that is of relevance of today is the increased threat of terrorism that are prevailing today, the vacuum system decreases the likelihood of bombs exploding in bins that has been seen all over the world in the past years. All of these aspects are value propositions of newness, if looking at Osterwalder and Pigneur's (2010) definition of the value proposition of newness, meaning offering the customer something that is new and innovating in that specific industry.

#### The proposition of *Performance*

Referring to the definition of the value proposition of performance (Osterwalder & Pigneur, 2010 ; ecommerce-digest, n.d.) Envac are certainly able to propose their stakeholders the proposition of performance. Envac takes care of the entire process from when garbage is produced, until it is taken care of, by their systems. The performance of their system is designed in that way that it is the collector's responsibility to take care of the waste as soon as the waste is thrown in the inlets. Compared to a traditional system, where one can see the garbage until it is collected, it is to some extent the end-users problem until the point of collection. With Envac's system the waste is the collectors issue as soon it is thrown down the inlet. The performance of the system makes it furthermore possible to densify the city further, since issues such as narrow streets or distances to drag containers for the collectors are problems that affect Envac systems.

#### The proposition of *Customization*

Envac systems are very flexible and one can easily adapt to conditions at site and to customers requirements. This fits with Osterwalder and Pigneur's proposition of customization. For instance, one important aspect defined by many stakeholders was keeping the distance to closest inlet to a maximum of 50 meters, this is not a problem if using an Envac system; it can be customized according to requirements. If Envac is invited in to the planning process of a project, and having a dialogue with the project managers, there are many possibilities. Envac has the ability to collect many fractions, the decision lies at the decision-makers. If using a vacuum system combined with the optical sorting system, almost every fractions existing is possible to collect. The ability to have a comprehensive system is in this case therefore possible. Many of the interviewees have been talking about adding value to residents by choosing proper disposal system, and by making it possible to sort as many fractions as possible at the same location is value adding according to the requirements of end-users.

#### The proposition of "*Getting the job done*"

Many construction companies have laws and regulations to fulfill. The system they chose therefore lies close to the proposition of getting the job done by Osterwalder and Pigneur (2010), it is important that the disposal system fulfills these set requirements. Envac offers support to handle these regulations. If Envac are invited in to the planning phase of a project, they have well educated staff knowing what kind of arrangements that has been successful previously. Envac offers guidance to fulfill



criteria. The fact that Envac's systems is not affected if unforeseen strikes occurs among waste collectors, or such, is also a benefit with the systems that Envac offers. Further, it has also shown during the interviews that people using the system, as well as purchasing the systems are satisfied with its features. They also state that it is a reliable system. The system does not suffer from much downtime, and it operates safely. The fact that Envac Scandinavia's customer survey generated in that "reliable" was the most frequent used word is a statement that has to be emphasized among the naysayers. In Gothenburg the naysayers are those that have been working with vacuum systems several years ago, when the technique was not as developed as it is today, and accordingly has had experiences of the system. The reliability aspect has to be pushed through to those people in an attempt to change their mindset towards the system.

#### The proposition of *Design*

Osterwalder and Pigneur (2010) states that design is something a company are able to propose to their customers. Design has further been shown during the interviews to be an important aspect, especially for end-users. The design of garbage rooms has been shown to often be unsatisfying. Envac has the ability to offer a solution to this by moving the inlets outside, and no garbage room is needed. If not planning an area according to where garbage rooms or garbage facilities should be located, there is an opportunity to plan the area according to people living there. Ultimately there can be planned for a more pleasant neighborhood with green areas, instead of planning for streets that makes it possible for refuse lorries to make their way to every garbage room in the neighborhood. The systems are designed in that way so that the neighborhood is safe from heavy traffic and people can live in the area without having to be worried. The design also makes it more hygienic in that sense. The waste disappears into the ground and one avoids looking at others wastes. Another hygienic aspect is that the system gives an odorless operation. The odor is also going underground. Consequently, pests are not drawn to the area to the same extent since the garbage is not exposed compared to a traditional system.

#### The proposition of *Brand/status*

According to interviewees representing construction companies, the vacuum system is seen as more luxurious to end-users. This is closely related to the definition of the proposition of brand/status (Osterwalder & Pigneur, 2010 ; ecommerce-digest, n.d.). The brand name was also mentioned as a strength in favor for Envac in the customer survey made by Envac Scandinavia's CEO, since they are the market leaders and well known in the waste industry. This was also very clearly during the interviews made with the construction companies since many of them stated that Envac is in some kind of monopoly position. The criticism directed to Envac of being in a monopoly position is incorrect since there are other actors offering vacuum systems on the market today. This is maybe due to the lack of knowledge of which actors exist on the market, but might also depend on the strong brand name Envac has developed over the years. One thing that can be concluded is however that Envac definitely has a

well-known brand in the industry, so this claim is therefore a proof of Envac's hard work. One identified opportunity is therefore to work towards an even stronger brand name and also to become well known among people in general, since the brand is not very well known to people outside the waste industry. These statements give an opportunity to propose value through brand/status.

#### The proposition of *Price*

During the interviews there have been a lot of discussing about prices. The initial investment was mentioned many times. If looking at the proposition of price (Osterwalder & Pigneur, 2010) a company can offer this in many ways. Envac are able to offer a long-term sustainable solution, gaining economically long-term. If investing in an Envac system the long-term costs will be less, compared to a traditional system, one are accordingly able to avoid other expenses such as weekly collections of waste. It offers low operation costs and low maintenance cost. Ultimately, it is a more long-term beneficial economical system. If looking at it from this perspective, companies do not have to choose between quality and cost anymore since it has shown to be a better financial investment and also of great quality.

#### The proposition of *Cost reduction*

There is a need of purchasing a disposal system that is an economical system. It is however a conflicting issue depending how to look at it. There are two differing viewpoints of what an economical system is with regards to these three systems. It has been shown that the traditional system is short-term beneficial since it is a cheap initial investment. However, if looking at long-term costs of the traditional system it is more expensive compared to the vacuum system. That is, if calculating long-term, the vacuum system is in favor. It is therefore arguable if the traditional system is to prefer if investing and calculating costs, since one utilizing desired space as garbage rooms in facilities, which could have generated income if sold or rented out instead. There have been studies showing that the income sold space would have generated also would have covered the initial investment for a vacuum system. So, related to the proposition of price (Osterwalder and Pigneur, 2010), the proposition of cost reduction is similar. The system is cheap to build if calculating the expenses over a period of time, more beneficial compared to the traditional system. This is the value proposition of cost reduction; Envac offers a long-term good investment that enables to cut costs if investing in a long-term sustainable solution.

#### The proposition of *Risk reduction*

This proposition is about reducing the risks (Osterwalder and Pigneur, 2010 ; ecommerce-digest, n.d.). Envac are able to offer their stakeholders risk reduction in that sense that Envac offers a reliable system. The system operates safely and one can always trust Envac to manage their part of the collaboration. Also the fact that traffic risks are reduced if investing in the system is also related to risks.

### The proposition of *Convenience/usability*

End users have stated that Envac's system facilitates the usage of the disposal systems - it is user friendly. This is the proposition of convenience/usability presented by (Osterwalder and Pigneur, 2010). The informal informants that have been interacted with during this research have stated that the vacuum system is seen as a brilliant solution in their neighborhood. They were curious about its features and how the system works. Two of the informant's lives in the area P5 represents and stated that they never suffer from operational stop, and that they are very satisfied with the system. One of the informants lived in an area where they closed the systems because of frequent troubles; the informant however never experienced any troubles related to the system and also states that it was a smooth system and very user friendly. One never had to get in touch with waste others had generated. It was just to throw it down the inlet and the waste was gone. These facts, that residents are happy with the systems, are an opportunity to keep emphasizing and a proposition stakeholders' value. Envac further has the ability to offer end-users to sort their waste at the same location. This is achievable if Envac are able to affect the outcome of a project since they possess much knowledge about usability and what users in general appreciate. Also, if using the optical sorting system combined with the vacuum system property close collection cannot be closer. Accordingly, every fraction can be thrown from starting point and this has been shown to be of importance. This is in line with the authorities motto of increasing the sorting and reducing the amount of waste generated, Envac are able to offer a solution to this.

## **6.2 Value Dimensions applied**

The identified needs' that did not fit into any of the value propositions in the previous chapter was mainly the values of good relationship to suppliers and the value of trusting partners. The dimension of trust has been shown to also be of importance to offer stakeholders. Another valuable thing for the developers, that is of mutual value to customers as well, is the value of interaction with customers. The agent's know how has also shown to be of importance, since there are political conditions in Gothenburg that are not covered in value propositions. These are some elements that are lacking in the value propositions by Osterwalder and Pigneur's. These propositions mentioned are highly related to the dimensions of value presented by Howden & Pressey (2008). It is more of a "soft-value" character. The value dimensions and value propositions are in this case complementing each other. I would claim that the soft values that a company is able to offer their customers are as relevant as the other value propositions.

It has shown that the ability of "being there" is of value to customers. That is the value of *location*, according to Howden & Pressey (2008). Since Envac has to create a demand for their products it is important to remind customer of their existence by being active on the market. The availability and the stakeholder interactions are therefore crucial. Even if the stakeholders are not customers who directly will buy

Envac's products, they might have an ability to affect future decisions. Envac especially needs to keep working for a mutual conversation with authorities, and invite them to interact with the company in order to turn the mindset around. They have to turn the naysayers, but also not forget to keep being available and interact with the yes-men. This is the value of location, to be "local" on the market.

P6 stated that if Envac are involved in a project they also handles the contact with Recycling and Water, which is convenient for the construction companies in order to fulfill every criterion set by the authorities. This is highly related to the dimension of *agent's know how* (Howden & Pressey, 2008) since, in the end, construction companies' expertise is not waste management - it is just an aspect they need to handle. Their expertise is building facilities. If being able to facilitate this aspect for the construction companies, there is an opportunity to add value to them as well. It is therefore important for Envac to be the experts in the area of waste management, and be updated on laws and regulations set. It is also of great importance to the company to educate their employees in their products and services, preferably also show every employee at the company a vacuum system in operation. By doing so makes every individual working at the company to ambassadors for the systems. They further also become experts in the area.

Building long-term relationships should lie in the interest of Envac since many people on the market in Gothenburg are negatively positioned towards Envac and its products and services. There is a need of creating a reliable relationship towards stakeholders by "being there". This is the dimension of establishing a relationship towards stakeholders built on *trust* (Howden & Pressey, 2008). Envac should be reliable in that sense of people feeling confident to turn to the Envac employees to ask for advice regarding waste management in general. By doing so, and not only focusing on economical growth, will possibly lead to a relationship built on trust.

It is important for Envac to have *personal interactions*, described by Howden & Pressey (2008), with their stakeholders in order to remind them of their existence. The sales process starts in Envac's case long before selling the product. Envac needs to work for building a need for their products by promoting values that exceeds the price. This is done through personal interactions. Personal interactions also means the generation of trust and service fulfillment.

The next important aspect that has been shown important during the interviews is the dimension of *service fulfillment* (Howden & Pressey, 2008). As stated before Envac has to be there for their stakeholders, by not only focusing on economical growth increases the service fulfillment. Stakeholders then gets support beyond what has been contracted and the value of trust will accordingly increase as well.

Investing in a vacuum system also means a reduced need for manpower. The costs for manpower will accordingly be reduced as well since refuse lorry drivers are not

needed. If cost is in focus, the vacuum system should accordingly be the preferred system at all times. On the contrary, if looking at it from the perspective of creating employment opportunities, it is not the best system. The refuse lorry driving profession will to some extent become automated. It is a conflicting value depending on how to look at it, it will decrease working opportunities, but lowering costs. This is related to the dimension of *direct/indirect cost* (Howden & Pressey, 2008).

## 7 Discussion

Osterwalder & Pigneur (2010) and Howden & Pressey (2008) bring up value propositions and value dimensions that are important to a company to offer their stakeholders/customers. However, issues of a lacking holistic viewpoint in the city of Gothenburg, with regards to the different stakeholders, testifies of a political issue that do not fits into any of the value dimensions or value propositions presented by the aforementioned authors. The market in this industry is much more complicated, with many actors that has a stake and opinion in how to handle waste in Gothenburg. One can conclude that the existing management tools covered in this paper is not enough with regards to stakeholder values in Gothenburg. As stated by Mills and Austin (2014), there is a distinction between value and values, the distinction is that some are moral principles and beliefs, and some are just a meaning of a thing and can be measured. The author of this research highlights the fact that in this case there are values that cannot be measured, but which are important to the result. It is values that Mills and Austin (ibid) explain as moral principles and beliefs. There are for instance a lot of political issues that has been highlighted and revealed during the research of this report, which does not fit into the existing theory. There is accordingly a gap. Some of the problems will be brought up in this discussion to clarify the complexity of this industry, which cannot be overlooked when making value propositions. To explain this gap in theory, some examples will be brought up in order to understand the complexity.

This research has given an insight in the contrasting views of stakeholder's opinions when it comes to waste management and disposal systems in Gothenburg. During the research it has certainly shown that the market in Gothenburg is conservative regarding waste handling. The author of this report would argue that if looking at the results given from the interviews there are no clear vision of how waste should be managed in Gothenburg. It is especially concerning when looking at the fact that Gothenburg is a city which is going to be doubled in size (Bobbyhuston, 2016). As for now, the new planned areas do not have a common vision; the stakeholders have contrasting opinions of how to develop the urban area with regards to waste management. Areas are planned according to areas, piece by piece, not from a holistic viewpoint. As for now, decision-makers are only focusing on individual pieces, not an entire puzzle that is going to be made. The viewpoint needs to be changed; a holistic viewpoint is needed and one needs to look at prerequisites and find common sustainable solutions of how the city should develop. During the writing of this report it has shown that there is unwillingness in broaden horizons and look at it holistically from the authorities in Gothenburg. If getting people to see the entire picture rather than just one area at a time, the chances of reducing traffic, pollution and create a safer living environment for the inhabitants in Gothenburg is greater. This is a win-win opportunity, and seems to gain every part involved, and is a value proposition worth considering. The opportunity for Envac in this case is to work for creating such

a mutual vision, and especially in Gothenburg where the attitude towards the systems at the authorities is very harsh at the moment. There is a great potential market in Gothenburg if succeeding with this challenge. If further referring to figure 8, the power/interest grid, it is of importance to note that this is the situation prevailing in Gothenburg at the moment, and that some of the stakeholders have more power to affect outcomes than they actually are using. An example of this was when trying to schedule the interviews for this research; the City Planning Office, The Environmental Administration, Renova and The Traffic office advised the researcher to contact Recycling and Water instead of interviewing them. They claimed that Recycling and Water are the ones responsible for every questions related to waste management in Gothenburg. However, when interviewing Recycling and Water they stated that they do not have that kind of power and that the responsibility sometimes lies with the other authority offices. The conclusion is that there is confusion among the authorities and that they do not take responsibility for their part of their work regarding waste management, and they are also confused on where the responsibility lies. It is therefore a need to make them cooperate and share the same vision. Envac needs to work for this, since it will bring value to stakeholders in the end. Envac also have to work for getting individual decision-makers to see the "whole picture", and this is perhaps only achievable if interacting with stakeholders to a high extent.

Another vital aspect referring to the fact that authorities acting confused when it comes to responsibilities regarding waste management is the fact that they totally lack information regarding the different waste disposal systems Envac offers. The authorities do not possess accurate information, especially regarding the optical sorting system. P4 stated for instance that optical sorting facilities have a hard time sorting out the plastic from the bags from the other fractions such as cardboard and food waste. P4 also claims that one adds waste (plastic) to collect waste, which is not sustainable. This is not true. In fact, the plastic bags are recycled and can be reused up to 20 times. In Oslo, where they have adopted optical sorting, they already meet EU's set laws and regulations. Ultimately, the arguments the authorities have against the systems are not based on any real facts, are outdated and are not reliable. The arguments are not in line with what Envac actually can contribute with via the usage of both the optical sorting system as well as the vacuum system. The fact that the authorities lacks proper information about the different systems is concerning. Especially when thinking of the fact that P4 stated on the interview that they do lack information regarding the optical sorting system, but still has arguments of why not adopt such a system. As can be read in appendix C, about the optical sorting system, one can see that there is no optical sorting facility in Gothenburg as for now and the system is therefore not used in Gothenburg. Considering this, it is truly concerning why the authorities argue against the system without any experience in the area. It is evident that the market is open for changes. There is a need for information and education, Envac can accordingly work on distributing this information to authorities and can contribute with education. They can also work for establishing a better mutual

relationship with Recycling and Water, since they seems to be in charge of question regarding waste disposal in the city of Gothenburg.

However, not only the authorities had a negative attitude towards the systems that Envac offers, also interviewee P1 had a reluctant attitude towards the same systems. The one common denominator these interviewees had in common is the fact that both of them are owned by the city of Gothenburg. The city of Gothenburg owns Renova, which are the collectors of the traditional system. P1's and P4's shared attitude towards Envac's systems might be a coincidence, but there is also a likelihood of wanting to promote self-owned business. One thing is clear; one can distinguish reluctance towards the vacuum system and its technique from people representing the city and authorities of Gothenburg. Moreover, if the city of Gothenburg is so negatively positioned towards the systems that Envac offers, Envac certainly face a hard future. As of today, the authorities in Gothenburg have the responsibility to collect food waste as well as general waste; this might however change in the future. The Swedish government are discussing if letting municipalities take responsibility for the collection of other waste fractions as well. They will accordingly have the responsibility for the collection of fractions such as cardboard, metal, plastic etc. In that case Envac will have difficulties establishing new projects in Gothenburg since Recycling and Water are very negatively positioned when it comes to both the vacuum system as well as the optical sorting system. There is a likelihood that the vacuum system will get even more reluctance in the city, and that the authorities actively will work to reduce the installation of the vacuum systems. There is therefore an urgent need for Envac to change the mindset at authorities and to emphasize on the value propositions that they are able to offer their stakeholders.

Considering all the value adding elements that was identified through the interviews, the researcher of this report argues the vacuum system combined with the optical sorting system is one of the most up-to-date solutions to a sustainable Gothenburg in the future. If looking at its features and consider the laws, regulations and visions authorities requires in addition to all of the other stakeholder values that has to be fulfilled, it is the only solution at the moment fulfilling all these aspects. If also considering the fact that studies have shown that waste fractions get sorted out to a higher extent if having it property close, optical sorting then eases this aspect, since it cannot become more property-close than placing the waste sorting inside households. Also the fact that the city is being densified, with narrower streets, and with an urge to decrease the heavy traffic in the city is aspects that is in favor for the vacuum system. SMART cities are also growing, and this is a sustainable aspect that is in favor for Envac and the technical intelligence their systems possess. If it becomes relevant in the future to weight base the waste on an individual basis Envac already possesses the technique. The system is already based on technical intelligence and there is a possibility to add instruments which enables the weighing. Their system is therefore in line with the development of the industry. Meaning that the systems Envac



possesses have the ability to propose something new and innovative to their stakeholders.

Furthermore, stakeholder values are certainly important to companies. Theory supports this. PM BoK (2013) states that stakeholder management might mean the difference of project success or project failure. The writer of this report agrees. Value propositions and value dimensions are important aspects to reflect upon when making new propositions to customers and stakeholders. It is important to be aware of what, and what not, a company is able to offer its customers. I argue that the stakeholder values are something that is of great importance to a company such as Envac, it is essential for the entire existence of the company. For instance, if Envac suddenly disappeared from the market, the waste management would consequently continue perform as it always has been done – with a (to some extent) well functioning traditional waste collecting system. Envac therefore have to create a demand for their products, since there are not a naturally demand for the vacuum system nor the optical sorting system. The stakeholder values, partly found through the interviews conducted in this report and through the research made, is therefore of essential value to the company and should be considered carefully when taking strategic decisions regarding the market of Gothenburg. It is of great importance to listen to customers and their demands; this report contains some answers to customer demand, and especially answers to stakeholders “soft-values”. If referring to the theory about value management, Envac needs to create stakeholder value so that Value-Price of Envac’s products and services exceed the Value-Price for the second best alternative. The question is accordingly how? Envac’s price for the systems they offers is far more than the price is for the traditional system. Accordingly the value given by purchasing their system needs to be superior to the value given by purchasing the traditional system. As stated before: the equation (Value-Price) conveys that the customer’s incentive to purchase a supplier’s offering must exceed its incentive to pursue the next best alternative. The identified values gathered from the interviews in this report must accordingly be used to market and highlight what values Envac are able to offer their stakeholders. The values one will possess if investing in an Envac system needs to be emphasized to a higher extent than it is today in order to persuade customers of the benefits and values one will possess through one of the Envac systems. Knowing stakeholder values eases the understanding of how to communicate and direct propositions to the right stakeholder, i.e. to segment the value propositions so that it fits with what different people want.

It is important to understand these values; values align people and organizations on projects. Everything is worth what its purchaser will pay for it; an important aspect is therefore to use the information one possesses. Envac needs to put focus on what adds value to customers. As for now, Envac know some of their key stakeholders needs – it is now a matter of how to fulfill and tackle them strategically.

In summary, the industry in Gothenburg is certainly very complex when it comes to waste management, it is therefore important to highlight once again the fact that the

theory does not support the entire situation prevailing locally in Gothenburg. There is a gap in the investigated management tools which do not include political aspects that are only applicable locally. Waste management and the collection of waste is governed by the authorities in Gothenburg, they are, in turn somewhat controlled by the Swedish government, which in turn are affected by European Union decisions, such as the waste hierarchy that can be read in Appendix A. There is furthermore some vested interest in collecting waste by using the authority owned company Renova, which collects waste traditionally. The value propositions Envac has to offer their stakeholders is therefore more complex than the propositions existing in theory, one have to consider that when establishing new value propositions. Envac have to segment their value propositions, directing them towards the receiver, and consider these aforementioned important aspects so that it fits the needs and values of that specific stakeholder group.

## **7.1 Method Discussion**

As for the value management process (figure 2), the first step to frame the work was made through the study of the theory and the decision of which stakeholder to interview. The interview questions were also a way of framing the work of this report. The gathering of the requirements was made through personal interviews, interactions and observations. Since stakeholder might not be aware of their needs, questions were designed accordingly, and one was able to identify value elements through the recorded and transcribed interviews. When identified the value elements the analyzing step of the value management process was made. This step contributed to a result of an overall understanding of requirements and what value they bring to the company. The identified requirements served as a basis in order to being able to establish value propositions to the company. The results of this report were presented during a strategic meeting about the development of the market in Gothenburg. The meeting included a workshop and brainstorming session how to strategically tackle the market in Gothenburg. The next step in the value management process, the step to process the information, is about giving feedback to stakeholders. This step, as for this report, is about giving feedback to Envac about the stakeholder values. This step is also about building consensus and generate ideas, which is made in the discussion and conclusion of this report.

The reason that optical sorting has not been put more focus on in the results is that the interviewee's in general had little knowledge about the system, since it is not a system that is used in Gothenburg. An optical facility is not established in Gothenburg at the moment. During the interviews people have in general however had a positive approach towards the system. The problem is however that the facility is not established and it is therefore the system is not used to a higher extent in this area.

Due to the fact that the report was conducted from the office of Envac, the opinions and viewpoints from what the company experiences as challenges in the industry is

therefore fully understood. One can question if the result would have been the same if choosing not to interact with Envac to the same extent. The result would certainly have been different if stakeholders not were chosen in collaboration with Envac since the stakeholders interviewed might not have been the same in that case. If the chosen stakeholders however would have been interviewed either way, the likelihood of that the outcome of the report would have been the same is still likely, since the answers from the respondents probably would have been the same in that case. The researcher are however aware of the positive respectively negative impacts of being close to a company when writing a report.

## 8 Conclusion

In the last years it has become a greater amount of actors on the global market than ever before. The need for understanding the sources of value from the viewpoint of the customer and stakeholders is essential for companies in an increasingly competitive environment. It has been shown that this is certainly crucial for Envac and the future existence of the company. Not only because it has become of great importance to companies of today in general, but also rather because of Envac is in need of creating a demand for their product and services by themselves since no natural demand for their products exist on the market today. Further are the answers to the research questions stated in the introduction presented.

### Who are Envac stakeholders?

These are the identified Envac stakeholders:

- Envac Employees
- The Stena Sphere
- Society
- Göteborg Municipality
- Construction Companies
- The Traffic office
- The Traffic Committee
- The Environmental Administration
- The head architect of Göteborg
- End Users
- Buyers
- The City Planning Office
- District Administrations
- Recycling and Water Waste Sweden
- Other Waste Entrepreneurs
- Safe, Beautiful City
- The Park- and Nature Management
- The Environmental Protection Agency
- The Real Estate Office

### How do Envac stakeholders value the different systems?

It is very clear that Envac stakeholders value the different systems very differently; depending on from which viewpoint one looks. From the perspective of the construction companies they value disposal systems that is efficient; meaning that it operates without downtime, that it is cost efficient, that it is user friendly, etc. Authorities value good working environment for waste collectors, also that it is user friendly, property close, and that it can handle the densification of the city. Developers value economical growth of the company and knowledge about demand. Users value that disposal systems is user friendly. Meaning that it is easy. Property close collection therefore lies in the interest of the end users. All of the above-mentioned needs can be met with systems offered by Envac, there is only a matter of how to market the product, i.e. by the use of segmented value propositions. One can also conclude that the values from different viewpoints are contrasting, and that there is a lack of a mutual and holistic vision of how to handle the densification of the city of Gothenburg with regards to waste disposal systems. Envac therefore needs to create segmented value propositions to satisfy the different needs among stakeholders.

### How can business models contribute to develop new management tools?

Although business relationships exist between companies, they are managed by individuals who represent both buyer and supplier firms. It is necessary to emphasize the importance of the personal interaction between Envac and their stakeholders. But

it is not a matter of only a buyer-supplier relationship, it is a matter of a stakeholder-supplier relationship, and in many cases the products Envac supplies has shown to be perceived as complex to many stakeholders. The need is to act accordingly and provide support, information and advices. Even if not gaining economically on these actions one builds a long-term trustworthy relationship, which might be valuable in the future, both to stakeholders and to Envac themselves. Trust is one of the value dimensions, and the opportunity to build further on this aspect is of importance. Since Envac have to start change mindset at authorities the aspect of providing necessary information to the authorities, even if it does not lead to economical growth, is an important aspect in order to start this shift in mindset at the authorities. They further needs to promote and market the city areas were the stakeholders are satisfied with the system, such as the area interviewee P5 represents. A way of doing so is to be more present at business events for instance. Also to engage people more, such as P5, who advocates the vacuum system. Envac can plan for and conduct inspiration days, or such, and invite people both negative- and positive positioned to the systems in order to exchange experiences. Trying to be more present at university events might also have a beneficial impact on business, since university students are the future employees of companies who might influence the market in the future.

Further suggestions directed to Envac are to keep a good relationship towards the construction companies, since they have stated that Envac offers such products that require an inclusive relationship. Other suggestions to adopt are to emphasize the value propositions presented in the chapter Analysis, which Envac are able to offer their customers. Envac has the possibility to offer value propositions such as *Newness, Performance, Customization, "Getting the job done", Design, Brand/status, Price, Cost reduction, Risk reduction and Convenience/usability*. They are also able to offer their customers value dimensions such as *location, agent's know how, trust, personal interaction, service fulfillment and direct/indirect cost*. It is however, as mentioned before, important to create segmented value propositions, targeted for the different stakeholder needs. Also important to note is the issue that has been discussed in the previous chapter, that the already existing management tools are not enough for covering the entire problem with the situation prevailing in Gothenburg. There are political aspects that are highly topical that one needs to be aware of before making value propositions, aspects that do not fit into value propositions or value dimensions suggested by Osterwalder & Pigneur and Howden & Pressey. There is accordingly a gap in the theory, which is not covering this issue. There is therefore a need for developing these management tools further. Developing new management tools is therefore needed.

Note that the value propositions are not valid for the needs of the developers, however, the developers' needs are very important information for the company to possess in order to create a pleasant working environment for people to thrive in. Further, if satisfying employee stakeholders they will become more eager and willing to contribute to the future development and success of the company.

## 8.1 Future research

As for this report, it has shown that all the big players on the construction market have in general a positive attitude towards the vacuum system. The attitude is also positive towards the optical sorting system, but there is however lack of knowledge about the system. On the contrary, the smaller companies working for the Gothenburg municipality have a negative attitude towards the system. The question is if this is because they build and further manage and own the housing, and the big construction companies do not. Is this the reason for the differing opinions? If this is the case, then the big construction companies do not account for the initial investment, but the smaller does. This is, in that case, perhaps a huge difference in opinions since the big construction companies are not affected by the investment. This is a topic for future research.

Another research topic would be to investigate end-users satisfaction with the different systems. Which end-users are most satisfied, and with what type of system. One would have had to investigate the optical sorting system in a city where they use this kind of system, so that they are aware of its features, also ask end users in a housing with the vacuum system as well as a housing with the traditional system.

Furthermore if there is a difference between recycling behavior for tenancy holder against tenancy-owner, if owning an apartment affects behaviors since the owner are affected by the housing associations economical situation compared to not being affected by the tenancy compounds economical situation if only renting an apartment.

There is also a need for reliable and objective reports to show the pros and cons with the different system, that shows the value of each system with regards to cost. There are reports addressing this topic, but they are not used to a high extent since Envac are the publisher, accordingly they are not as reliable as if an objective part would have done the research. One can therefore identify a need for objective reports to be conducted.

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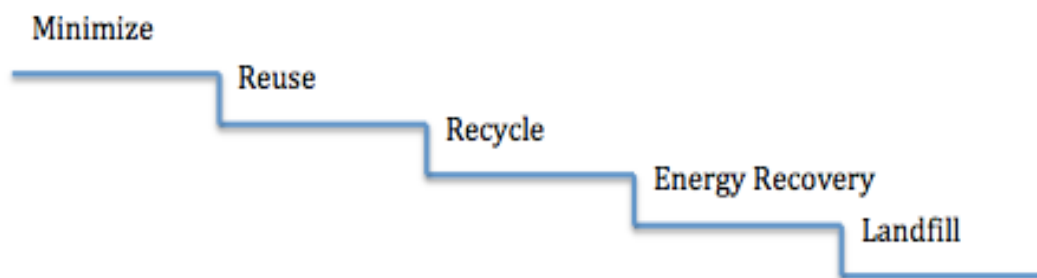
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## APPENDIX A – THE EUROPEAN WASTE HIERARCHY

European union has developed a waste hierarchy, as can be seen in figure 9, in order to both prevent the generation of waste, but also to work for taking care of as much materials as possible. The meaning of the waste hierarchy is to, step by step, follow the staircase, from the upper step on the staircase until the last step on the ground, to decrease the generation of waste as much as possible. Step one, minimize, is to work for minimizing the waste generation overall, the reduction of waste. This is, according to Sopor (2016), the best way to reduce the usage of the natural resources the world provides us. The second step in the waste hierarchy is to reuse as much as possible, by for instance give away products or clothes to second hand stores. Further down on the staircase is material recycling. Recycling gives an opportunity to turn already used materials into completely new products, e.g. with papers and cardboard. Recycling in this case also means composting or anaerobic digestion of food waste and garden waste. If it however not is possible to recycle the waste, the energy from the waste should be taken care of through incineration of waste, meaning energy recovery. The last step, if all of the above-mentioned steps are not possible to achieve, the waste has to go to landfill. This waste is of a hazardous character (Sopor, 2016). Every European Union country should always strive to follow this staircase, according to European Unions regulations. This waste hierarchy affects decisions made locally about which waste disposal system to choose.



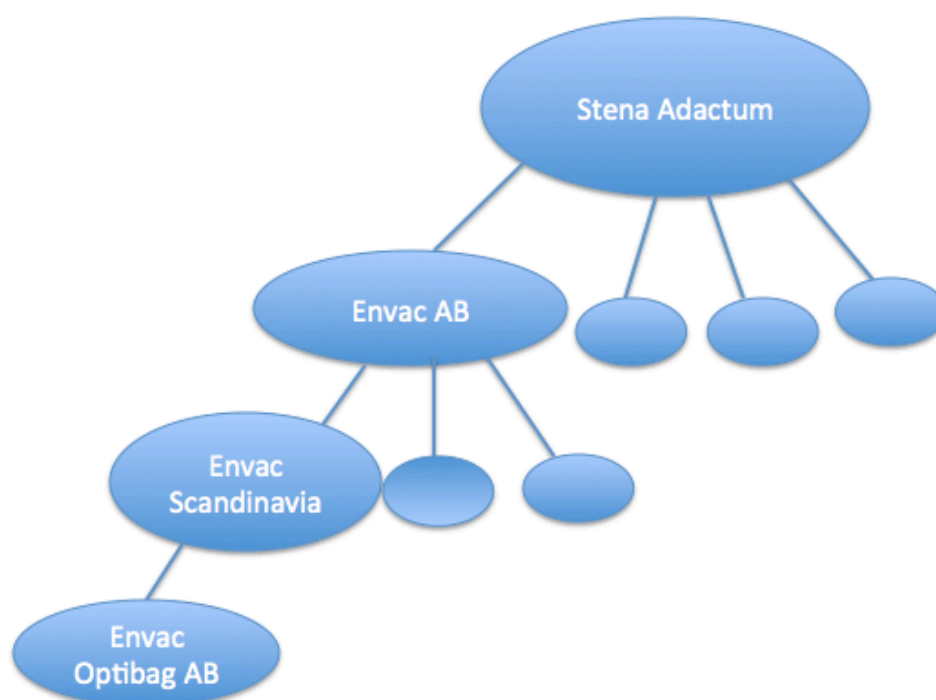
**Figure 9** The Waste Hierarchy

## APPENDIX B – COMPANY DESCRIPTION

This appendix contains a brief description of the partner company, Envac, which offers different solutions for disposal of waste.

### **Envac: Removing waste – creating value**

Envac AB is a subsidiary company, 100% owned by Stena Adactum AB. Envac AB owns Envac Scandinavia, which in turn owns Envac Optibag AB, who supply optical sorting equipment (Envac.se, 2016). See figure 10.



**Figure 10.** *Business structure*

Envac offers three waste collecting solutions, the stationary vacuum system, the mobile vacuum system and an optical sorting system called Optibag. The vacuum technique that Envac developed in the 1960's is known today as the automated waste collection system using vacuum technique. The system is coordinated with the installation of infrastructure, telephone lines, electricity, sewerage and water pipes. It is an infrastructure in itself, consisting of pipes hidden in the ground (Envac, n.d.). Since its establishment Envac has grown to become one of the leading environmental technology company in Sweden and a corporation operating globally (Envac.se, 2016 ; Envac, n.d.). Envac's systems is established and implemented worldwide and Envac has 35 offices in 22 different countries in Europe, the Middle East, Asia, North America and South America. The system operates in different industries, in the private sector as well as the public sector. It is established in neighborhoods, shopping centers, town centers, industrial kitchens, hospitals and airports (Envac.se, 2016).

### **The business idea**

*“Automated waste collection shall be perceived as an obvious solution for waste management and a natural part of the cities’ and buildings’ infrastructure”* – is the vision of Envac (Envac, n.d.).

Envac’s mission is to relieve the cities of the world of a growing traffic and waste problem. They intend to accomplish this by freeing up streets, market squares and buildings from disturbing waste handling (Envac, n.d.).

Envac has three values that they abide by, these are: *reliability*, *rationality* and *sustainability*. Envac states that they want to fulfill what they promise and that the units fulfill what customer expects, meaning that they are reliable. Rationality is the pursuit for the most rational and economical solution for customers. Sustainability means the intention to always work for sustainable solutions, which meet environmental, social and economic criteria (Envac.se, 2016). According to Envac (n.d.) the units that Envac installed in the 1960’s are still in operation and are a proof of the sustainability the technology offers, also the operational safety.

Waste in cities around the world is traditionally transported using vehicles. However, Envac states that in environmentally sustainable cities the waste should travel in closed, invisible systems under ground (Envac, n.d.). Envac has, in other words, moved the waste management underground. The idea of the systems that Envac offers is to freeing up space inside and outside buildings, to reduce heavy traffic and to reduce costs regarding waste collection. Envac believes that by doing so will benefit both building contractors and residents (Envac, 2014).

The additional cost for one apartment when installing an Envac system is the same as the installation of a new fridge, the operational cost for one apartment each month is equal to buying a ice cream. Yet it seems like an expensive investment, but according to Envac it creates a higher value and a sustainable future (Envac, 2014 ; Envac.se, 2015).

## APPENDIX C – WASTE DISPOSAL SYSTEMS

This section contains an explanation of the relevant disposal systems that are discussed in this report. The intention is to give the reader a deeper knowledge about the subject, which further will contribute to a better understanding. The systems that will be explained are the stationary vacuum system, the mobile vacuum system, the optical sorting system and the traditional system.

### Traditional Waste Disposal System



**Figure 11.** *Example of Traditional Waste Disposal (Concertproperties.com, 2014)*

The traditional waste disposal system consists of garbage rooms. Dividing fractions in different containers is perhaps the most common and recognized system at the moment in the waste industry. Like the other systems that further will be described in this report, there are some advantages as well as issues related to the traditional waste collecting system. A traditional collection system certainly requires more space compared to the other systems, since an entire room has to be a designated to garbage. Issues with garbage rooms might also be that they differ, from facility to facility. Some garbage rooms have bins for every type of fraction, whilst other garbage rooms for instance only has bins for general waste and glass. The lack of different fractions for different materials might lead to laziness among tenants, and materials that are to be thrown in one certain fraction might end up in a general waste bin if there are bins for certain fractions missing. There is however garbage rooms that are very well equipped, as can be seen in the example illustrated in figure 11. As been stated by Dahlén (2008) property-close collection leads to increased collection of sorted materials, and the example in figure 11 facilitates the recycling process by having many fractions and bins to choose from.

Another issue related to the traditional system is that waste collectors collecting the garbage in the bins or containers are on the third place on the list of professions that are most exposed regarding sick leave. This is due to the fact that they are exposed to hazardous working environments because of heavy lifting etc. (Avfallsverige.se,



2016). However, there has been put more focus on the working environment in terms of ergonomics for this profession. Arbetsmiljöverket requires that garbage bags should weigh less than 15 kg, waste containers are to be drawn on solid ground and not to be lifted in staircases, and it applies for waste bags as well. Meaning, in order to meet and to fulfill these requirements the garbage room should be placed on street level. The lifting of bags of 8-9 kg is furthermore limited to a maximum amount of 15-20 per person per day (SWECO, 2001). Arbetsmiljöverket (n.d.) however stresses in their report that manual handling should be avoided completely if possible.

Arbetsmiljöverket (2012) also states in their report regarding ergonomics that: workplaces and work duties shall be designed to reduce ergonomic- and health risks, unnecessary dangerous exposure to the body shall also be avoided. They (ibid) further states that the employer should work for the reduction of musculoskeletal disorders (MSDs) by not handling garbage bins and containers manually, in the following order of priority:

1. Investigate possibility if the handling of bins manually can be avoided,
2. If above mentioned point is not possible, take the necessary actions needed to design the working methods so that the body is exposed minimally to heavy lifting's that can cause MSDs,
3. Educate and inform employees about ergonomically working methods so that risks are reduced (Arbetsmiljöverket, 2012).

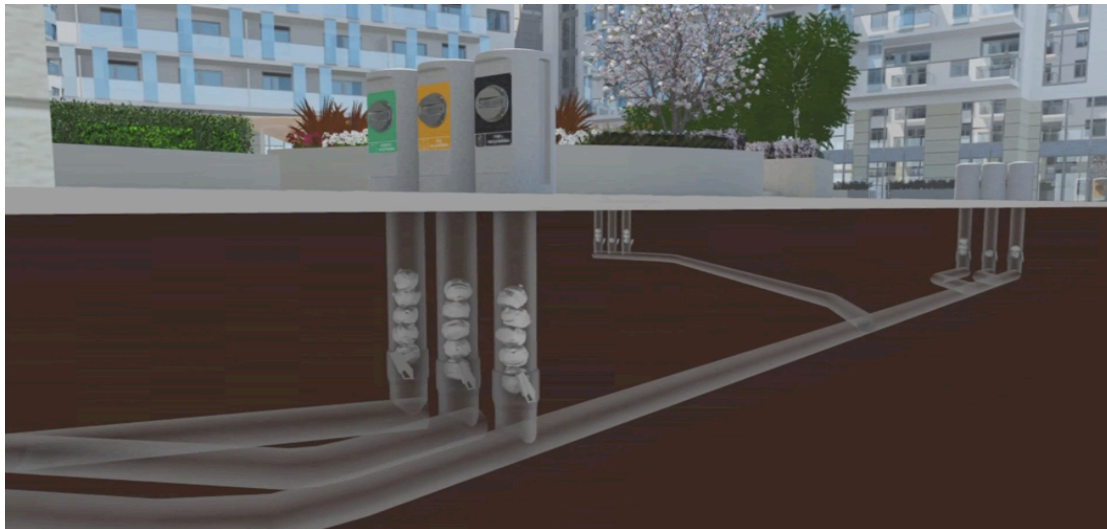
One advantage with the traditional system is that if using this kind of system in the urban areas, in parks for instance, one can easily move and remove bins if they are not needed. If comparing to a vacuum system, it is not as easy to relocate a bin that has been placed to a certain place since they are connected to the infrastructure underground. Further advantageous aspects are that the traditional system is a cheap system to invest in.

### **Stationary Vacuum System**

The stationary vacuum system is one of the systems Envac offers today. Below is a description of how it works, some advantages and challenges with the system and examples where it has been installed.

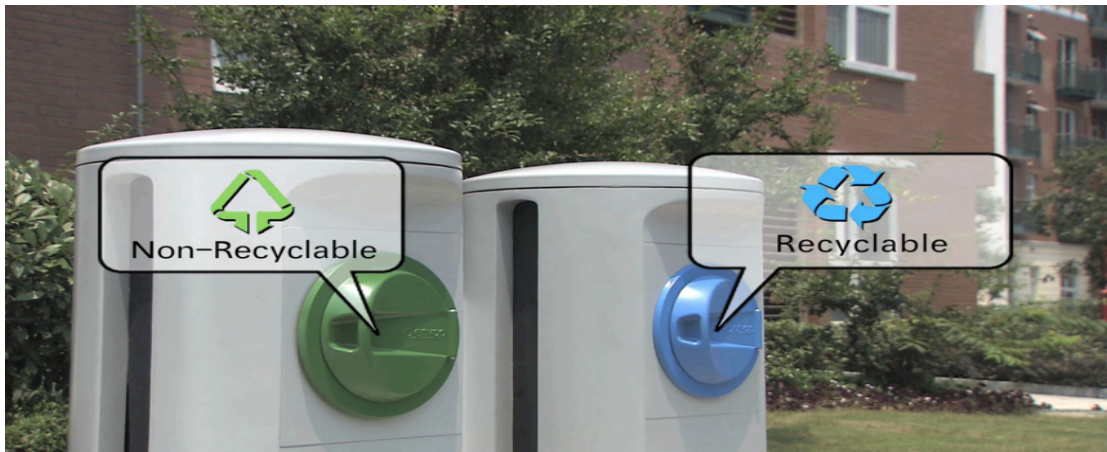
#### How it works

The stationary vacuum system has replaced the traditional systems with bins in garbage rooms with waste inlets connected to an infrastructure consisting of pipelines transporting the waste underground to a central collection station outside the urban area (Envac, 2014). This is illustrated in figure 12. Just like the idea of burying sewage, electricity and water in cables and pipes underground came the idea of doing the same with waste (Envac.se, 2016).



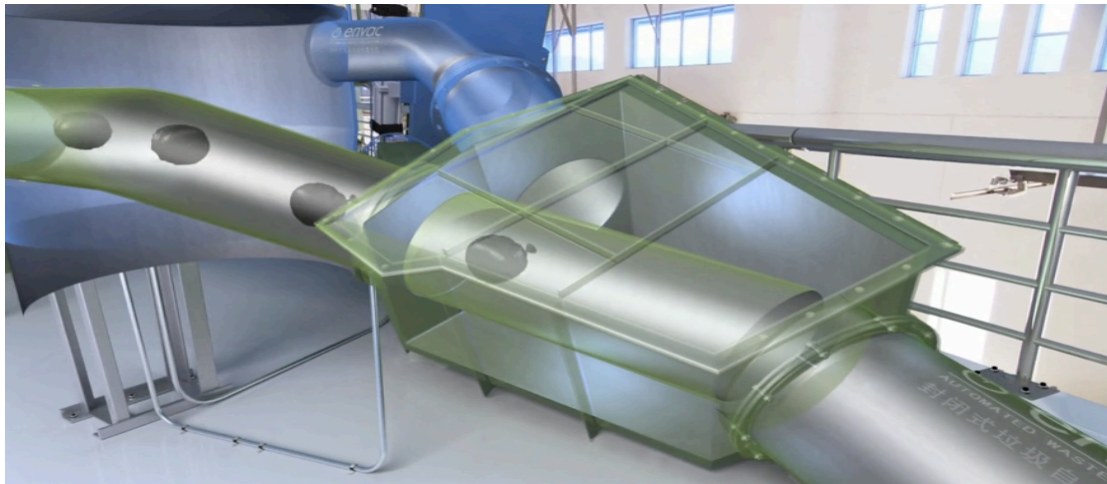
**Figure 12.** *The system underground (Envac.se, 2016)*

The garbage bags are thrown into an inlet. There are different waste inlets for different fractions, e.g. one for cardboard, one for dry recyclables, one for general waste and one for pure food waste, recyclables and non-recyclables etc. (figure 13). Furthermore, the buyer has the opportunity to decide by themselves how many fractions and how many different inlets they want to install to the system, according to an Envac employee. The only fraction that Envac does not offer is a fraction for glass, since it might have a negative effect to the pipes.



**Figure 13.** *Example of inlets (Envac.se, 2016)*

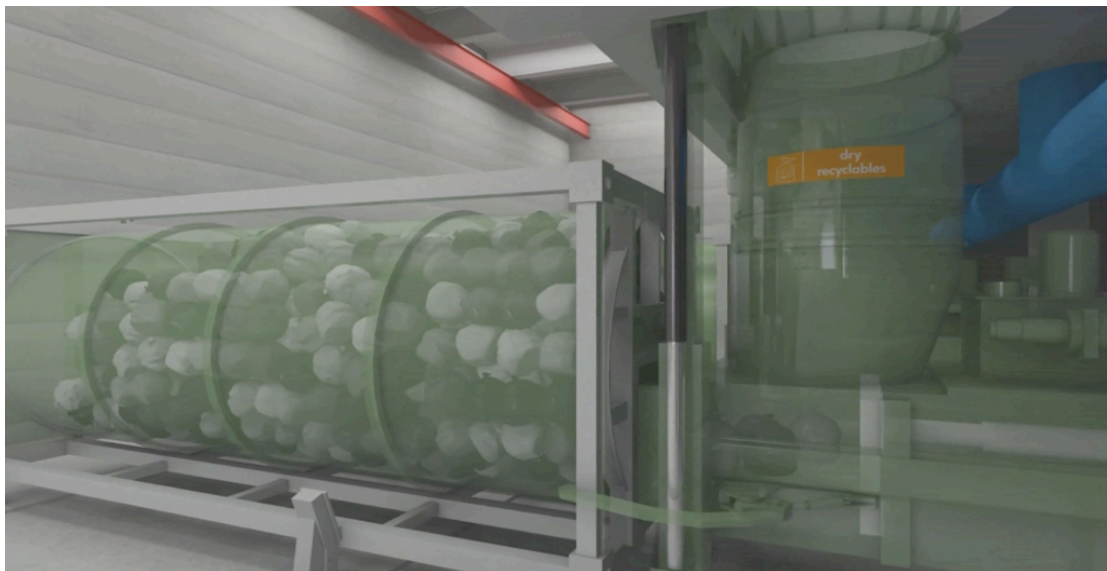
The garbage bags are then temporarily stored on top of a closed valve. Inside the inlets there are sensors which are able to sense if the inlets are full, in case of a full inlet the valve opens, and one fraction is emptied and controlled at a time (Envac.se, 2016). There are different temporarily storage pipes for different fractions, when one fraction are full the valve to the storage pipe are opened and emptied into the joint pipeline that connects all pipes together and that transports the waste to the container. The different fractions end up in the right container by means of switching valves (figure 14), which is located in the end of the pipeline (Envac.se, 2016).



**Figure 14.** *The valve switch that helps sorting waste to proper container (Envac.se, 2016)*

When one fraction of garbage is emptied, it is transported underground in the joint pipes at a speed of 70 km/h to a container which is situated outside the urban area (see figure 15). The air of the waste is then collected and goes through a cleaning process of filters of which the purpose is to neutralize the smell.

When the containers of garbage are full a lorry replaces the containers (Envac, 2014). The refuse lorry transports the full container to plants for different recycling areas such as incineration, composting, recycling or landfilling. The empty container is furthermore replacing the full container and the system is ready to operate once again (Envac.se, 2016).



**Figure 15.** *Containers located outside the urban area (Envac.se, 2016)*

An Envac employee states that the containers can be placed outside the urban area up to 3 kilometers away from the farthest inlet. However, Envac recommend placing the container area 2 kilometers away for best possible prerequisites. Furthermore, the ones responsible for collecting the containers are the municipality's contracted waste collector entrepreneurs, e.g. Renova.

The expected life cycle of a vacuum system is 30 years or longer (Envac.se, n.d.). According to ISWA (2013), the design life of the piping infrastructure is estimated to be around 60 years.

### Advantages

The system is designed and operates under ground, which gives the opportunity to free space inside and outside buildings, space that would have been used as garbage rooms in other cases. The unutilized space can, for example, be used as businesses opportunities and thereby generate economic inflow, or it can be used as additional apartments and thereby also generate economical growth.

Furthermore the stationary vacuum system reduces the heavy traffic caused by refuse lorries, since the system has the pick-up point situated outside the urban area (Envac.se, 2016). An illustration of one collection point compared to collecting in the traditional way by picking up waste from garbage rooms at every residence can be seen in figure 16.



**Figure 16.** An illustration of one collection point (left) compared to a traditional container collection system (right) (Envac Scandinavia AB, n.d.)

The stationary system also allows narrower streets to be built, and also the ability to use areas as green areas instead of building broader streets to ease the driving for refuse lorry drivers. By reducing the need for driving, accordingly one reduces the amount of pollution and also the noise for those living in the area (Envac Scandinavia AB, n.d.).

Another interesting advantage with the vacuum system is of relevance today, with a world full of terrorism. The increased risk for terrorist attacks has generated in an increased interest for the vacuum system in France, for instance. The requirements on safety along with the environmental awareness have become important. A vacuum system allows a safer solution when it comes to terror related actions; a vacuum system provides a better protection against bombs. The explosion would ultimately take place under ground and the bomb would also already have been transported

further away thanks to the vacuum technique. There are furthermore fires commonly occurring related to waste and waste management in France, and the reasons are various. This have ultimately led to that the authorities have high demands on safety when it comes to waste management, and the vacuum system meet this demand (Tollgerdt, 2016).

Other, perhaps unlikely, events that might occur such as strikes and protests will not affect the system since it is automated. The same applies for extreme weather conditions, meaning that this will not impact the running of the system (ISWA, 2013).

### Challenges

There has been an ongoing debate about who should bear the main responsibility and ownership of a vacuum system, and the issue remains unclear (The Waste Sweden Utveckling, 2013). It is therefore one of the challenges with the system, who should take on the main responsibility for the joint pipelines. Further, since a vacuum system implies a greater amount of initial investment compared to a traditionally container collection system it is also a question of economical matter (The Waste Sweden Utveckling, 2013).

### Examples

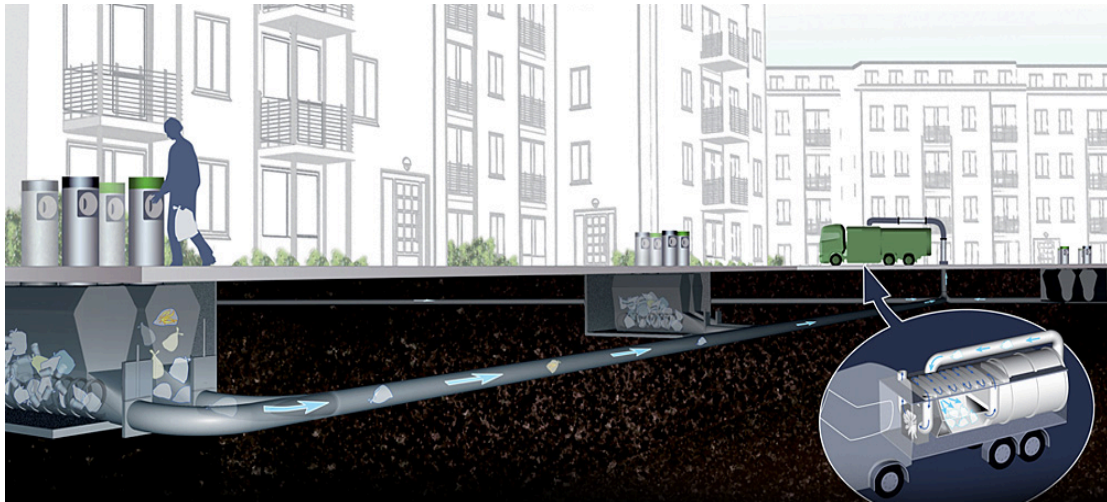
Examples of a city that has adopted the stationary vacuum system is in the city of Bergen, Norway, and in Barcelona, Spain. One of the reasons that the municipality of Bergen in Norway decided to install a vacuum collection system was due to the fact of the reduced risk of fire (Envac.se, 2016 ; Logiwaste.se, 2016). Furthermore, one example of where the landowner has taken on the ownership is in Kvillebäcken, Gothenburg, Sweden. The landowner installed the system and the facility owners had no choice but connecting the buildings to the vacuum system.

### **Mobile Vacuum System – Movac**

The mobile vacuum system was developed in the late 1980's and operates almost the same as the stationary system (Envac.se, 2016). This system is primary most suitable for small- and medium-sized areas.

### How it works

The Movac system works the same as the stationary system, the mobile system benefits from the underground transportation pipelines. However, the difference between these two systems is that the mobile system temporarily stores the garbage bags in closed tanks connected to the inlets. These tanks are emptied regularly. When emptied, a refuse lorry docks onto a docking station, which has been placed strategically in the area, and vacuums the garbage bags to a container on top of the truck, see figure 17 (Envac.se, 2016).



**Figure 17.** *The mobile vacuum system (Envac.se, 2016)*

The size of the closed tanks is adapted to the size of the property and amount of waste that is generated from the residents. Also the frequency of when and how often the truck emptying the tanks is adapted to the demand.

The waste collecting truck has the same task as the stationary container; it collects the waste through the infrastructure of pipes under ground. The waste collector can easily collect the waste by docking onto the docking point and vacuum the waste. As well as for the stationary collecting system the container on the refuse lorry possesses a filtering system, which filters the waste from dust and odors (Envac.se, 2016).

The maximum distance of this infrastructure, and underground system, that is recommended by Envac is 300 meters, from the docking point to the farthest inlet, according to people working at Envac. Further, it is possible to install the mobile system in new constructions as well as in old areas, in individual buildings and for terraced houses (Envac.se, 2016).

### Advantages

The benefit of this system, among other things, is that the docking points can be strategically placed in areas of the neighborhood so that the waste collector truck does not necessary have to drive in crowded areas, which eliminates risks for accidents (Envac.se, 2016).

Examples of other benefits from installing a Envac system is for instance that the heavy traffic caused by waste collection trucks is decreased by up to 90%, since the collection point can be redirected to areas that are less crowded, according to Envac.se (2016). Another benefit is that the time it takes to collect the waste is reduced, since the truck does not need to pick up waste as frequently compared to the traditional system and accordingly needs less time in the area. The driving distance is also decreased, since the truck only has one docking point and does not have to collect waste from every garbage room in every building. Another positive viewpoint is the

environmental aspect, decreased driving distances equals less pollution (Envac.se, 2016).

According to Envac employees there is also a matter of a reduced need for labor. There are 2 Movac drivers at the moment covering the existing Movac systems in the area of Gothenburg.

As well as for the stationary system, the mobile system allows the vacuum industry to develop further (ISWA, 2013). The Pay-As-You-Throw (PAYT) concept has for instance been introduced, which aims to decrease people's waste throwing habits. The PAYT principle builds on the idea of limiting amount of waste thrown per household. For example, people are allowed to throw away 6 garbage bags per week, if exceeding this limit one pays for every exceeded bag. Meaning that the system charge people who exceed the allowed limit of bags that is thrown away every week. The mobile system, as well as for the stationary system, has the opportunity to install inlets which only opens with certain tags or keys. The tag, or key, register who throws the bag, and by doing so also keeps track of the thrown away amount per week.

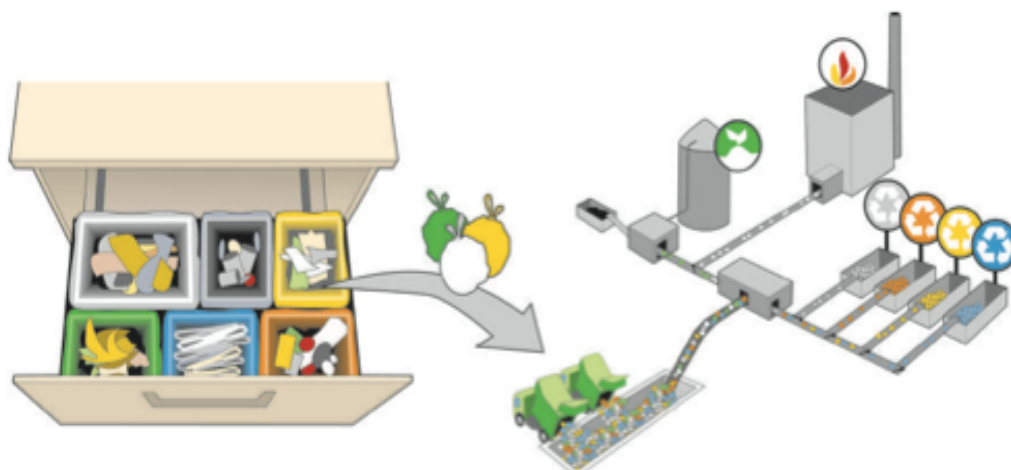
### Challenges

As for the initial investment, the mobile system does not require as much as the stationary system and it is not as tangible challenge as for the stationary system. However, when installing a mobile system it requires preparation and planning. It is not only about deciding to install such a system, since there are digging involved. It also takes time to plan for and install the system, compared to the traditional system where one garbage container can be added or removed without any further notice. Another challenge to consider is the fact that it is often many parties involved when installing such a system. The land area might not have the same owner, and the pipeline ownership might be questioned, therefore one has to find a common solution.

### Example

One can find Movac systems on several places, but one example of such a system installed is in Saltsjökvärn, Stockholm. The area was built in 1998 and consists of 600 apartments and a luxury hotel. 20-25 apartments share one inlet. Due to the installation of the mobile system 500 m<sup>2</sup> was freed, the freed space was further sold and the initial investment of the system was immediately refunded (Envac.se, 2016).

## Optical Sorting System - Optibag

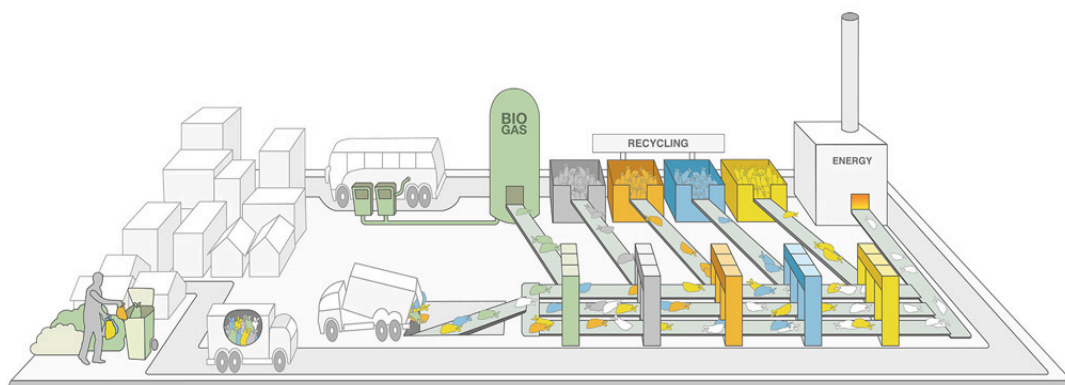


**Figure 18.** *The Optibag system starts in the households by the usage of colored bags (Envac.se, 2016)*

Envac Optibag AB is today 100% owned by Envac Scandinavia AB. This system is a fully automated optical sorting process. This system is not adapted in Gothenburg at the moment, since there is not an established optical sorting facility in the city, discussions are however held regarding future implementation of the system.

### How it works

The idea is to let the households sort their waste in different colored bags at home, using one bag for each waste fraction (figure 18). For instance, the green bag for food waste, red bag for paper, yellow bag for cardboard, blue bag for plastic and the orange bag for general waste. The bags are then thrown into whatever system the customer wants, the traditional waste container collection system or the vacuum system underground. The waste is then collected and transported to an Optical sorting facility where the bags are sorted out to the right recycle container via the usage of optical sorting sensors. The sensors sense the colors of the bags and transports the bags automatically on a conveyor until the bag reaches the proper container for the different fractions, see figure 19 (Envac.se, 2016).



**Figure 19.** *An example of an Optibag facility (Envac.se, 2016)*

### Advantages



The benefits with this type of system, according to Envac.se (2016), is that there is only a need for a small space in a facility dedicated to waste since every bag is thrown into the same container. Ultimately, there is no need for a big garbage room or a garbage house with different containers for different fractions. The waste logistic is furthermore improved for the same reason; every bag is collected at the same occasion and the different fractions do not need to be managed differently. By collecting every fraction at the same occasion decreases the transportation needs, which accordingly generate less pollution. An advantage of adopting a Optibag system is that one are able to choose if one wants to use a traditional garbage room to throw the garbage bags in, or if one wants to install a vacuum system to throw the garbage bags in. Both solutions are possible with Optibag. Another benefit is that the households are able to sort their waste directly at home. Studies have shown that it is beneficial; the easier it is, the more likely it is that people recycle (Envac.se, 2016). Furthermore, Optibag offers recycled bags for their optical sorting. This kind of bag is able to be recycled up to 20 times, according to information given at Envac. The beneficial aspect of the usage of recycled bags is that it is more sustainable, environmental-wise. This system has shown to already meet the restrictions regarding food waste set by the European Union.

### Challenges

When it comes to challenges for the Optibag system the facility must be established and built, the initial investment for the facility might therefore be expensive. However, this facility can be used by many actors using the optical sorting as a waste disposal system, accordingly the investment does not have to be expensive. If not investing by own means, one challenge might be to engage the municipality to participate in such an establishment. This has shown not to be an easy task, some municipalities are more eager to invest in a facility like this than other municipalities are. Another challenge is faced when the decision of investing in a facility has been made, the challenge will accordingly be to inform people. Also, a decision of where the responsibility lies for the distribution of the bags has to be made. Some municipalities has taken the opportunity to place different colored bags in supermarkets, where it is up to the customer to decide which one to buy along with the food. In other municipalities the bags are distributed for free to the inhabitants, states an Envac employee.

Another challenge is that it requires space at home. If looking at figure 18 one can see that a entire kitchen drawer has to be dedicated to the household wastes, since it is many fractions that are to be sorted out. Some people might not have the possibility to free this space required in their kitchens.

### Examples

One example of a city where they have chosen to invest in Optibag sorting plants is in Oslo, Norway. It is the largest investment in Optibag facilities in Norway. As for 2009, 30% of the waste generated in Oslo was recycled into new products. The number is even higher today. Investments in additional Optibag facilities is planned

and the extension of the Optibag infrastructure means that the municipality of Oslo is aiming to take care of 200 000 tons of waste annually. This includes all household wastes generated by the entire population in Oslo, 580 000 inhabitants (Envac.se, 2016).