Barriers to Eco-innovation - A Qualitative Study on Large Manufacturing Companies

Master’s Thesis 30 credits
Department of Business Studies
Uppsala University
Spring Semester of 2019
Date of Submission: 2019-05-29

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Acknowledgements

We would like to thank and show our gratitude to our supervisor David Andersson at Uppsala University. His support and valuable guidance have been important during this process. In addition, we are grateful and want to thank all participating companies and respondents. Without you this study would not have been possible to perform.

Uppsala, May 2019
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Abstract

Over the last decades the concept of eco-innovation has increased its relevance among academics, practitioners and policy makers. The majority of prior literature has concerned eco-innovations and their drivers. Research concerning the barriers to eco-innovation is however scarce, especially among large companies. The purpose with this thesis is therefore to extract further information regarding the field of the barriers to eco-innovation. The aim is to contribute with enhanced knowledge and expand the current literature, as focus is placed on large companies and their barriers. This has been done by implementing a qualitative approach. Twelve semi-structured interviews have been performed with respondents in nine large Swedish manufacturing companies. Secondary data has also been collected in order to triangulate the primary data. The findings show that the main barriers for the large companies to be eco-innovative are related to the awareness in the organization, the quality requirements for the products and production process as well as the regulations affecting the company.

Keywords: Eco-innovation, Barriers, Large Firms, Sweden, Manufacturing Industry
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1. Introduction

The consequences of the world’s inactions against climate change have started to take its course. Extreme weather conditions causing floods and fires are events that have left people engaging in a sustainable development wondering if we are sleepwalking our path to an environmental catastrophe (World Economic Forum, 2019). In 2015, the United Nations, UN, implemented 17 sustainable development goals for the UN’s members, that would make up a blueprint for handling our planet’s challenges (United Nations, n.d.B). It is estimated that to carry through with these goals, it will cost $4.5 trillion per year from 2015 to 2030. In order for this to be possible, there is a great dependency by the national community on the private sector’s resources (Ernst & Young, 2017).

The private sector has started to respond and the issue with the changing climate has been moved up on the agenda and is currently one of the most important aspects among today’s enterprises (Halila & Rundquist, 2011). Commonly, environmental actions have not been associated with company growth (Andersen, 2004; Carrillo-Hermosilla, Gonzalez & Könnölä, 2009). However, the problems with the ongoing climate change is a high priority issue that has led to a pressure on the companies to create an environment that is cleaner (Pinget, Bocquer & Mothe, 2015) as the companies’ way of manufacturing their products undoubtedly has a significant environmental impact (Carrillo-Hermosilla et al., 2009). This pressure stems from both the consumers (Wong, 2012) and from regulations (Pinget et al., 2015). One response from the companies is in the form of a new type of innovation called eco-innovation (Pinget et al., 2015). An innovation concept that entails a creation of business value while significantly reducing a company’s environmental impact by the change of products and processes (OECD, 2011).

Although the eco-innovation concept has received substantial attention in today’s research, by several authors such as Halila and Rundqvist (2011), Marin, Marzucchi and Zoboli (2015) and Bossle, Dutra de Barcellos, Vieira and Sauvée (2016), the concept is still growing in both academia and in practice (Schiederig, Tietze & Herstatt, 2012). Previous academic articles have predominantly depicted the drivers to integrate eco-innovation into companies’ business strategies (Marin et al., 2015) and emphasis has been on the benefits the concept entails. Yet, the diffusion of eco-innovation has not been as great as one could hope for (Halila, 2007; Hörte & Halila, 2007; Carrillo-Hermosilla et al., 2009).
For this diffusion to start, there are barriers to eco-innovation that need to be tackled (Halila, 2007; Hörte & Halila, 2007), such as costs, competency and market position (Marin et al., 2015), that are specific for the field of eco-innovation (Halila, 2007; Hörte & Halila, 2007). However, as earlier research mainly has focused on the drivers to eco-innovation (Marin et al., 2015), the barriers to eco-innovation have been pushed to the background (Marin et al., 2015) and are yet to be explored (Pinget et al., 2015). In particular, the barriers to eco-innovation for the large companies need to be investigated as most of the authors that have written about the barriers, such as Marin et al. (2015), Oncioiu (2015) and Pacheco, Schwengber ten Caten, Jung, Ribeiro, Navas & Cruz-Machado (2017), have focused on the barriers for SMEs, Small- and Medium-sized Enterprises. Therefore, this study will concentrate on the barriers for the large companies to become eco-innovative with a directed focus on manufacturing companies domiciled in Sweden. The manufacturing industry, “that produces goods rather than services” (Cambridge Business English Dictionary, 2011, page 520) is of great necessity to study as the industry represents a great share of the total resource consumption as well as the waste generation in the world. The manufacturing industry accounts for almost 33% of the energy usage in the world. In addition, it is generating 36% of the world’s CO₂ emissions (OECD, 2010).

Based on the impact that the manufacturing industry currently has on the environment and on the research gap regarding the barriers to eco-innovation, this study addresses the need to study the barriers for large manufacturing companies to become eco-innovative owing to their impact on the environment. Thereby, this paper aims to answer the question:

*What are the main barriers to eco-innovation for large manufacturing companies domiciled in Sweden?*

Drawing on contributions from interviews with nine different companies within the manufacturing industry and annual reports, this study aims to contribute with enhanced knowledge on the existing barriers that large companies encounter when changing to an eco-innovative strategy. Moreover, this study aims to expand the current literature on eco-innovation barriers as it adds amplitude in the academic field by studying large companies instead of small- and medium sized enterprises. By doing this thesis, we want to provide insight, for both companies and academia, in what it takes to tackle today’s environmental challenges.
The next section of the thesis will encompass the previous studies on eco-innovation ranging from the definitions of the concept, drivers and the barriers. In section three, the methodological approach will be described and section four will present the empirical findings together with an analysis of the results. Lastly, conclusions and suggestions for further research will be presented.
2. Theory

In the following section, previous research on eco-innovation will be addressed. First of all, the concept of eco-innovation will be thoroughly reviewed. Subsequently, the drivers to eco-innovation will be presented, followed by the different barriers that will be explained in great detail.

2.1. The eco-innovation concept and definitions

Between the years 1997 and 2017, the definition of eco-innovation has had slight changes as one can see in Table 1. Some definitions include positive impact regarding both the environment and the business value, such as in the definition by James (1997), Reid and Miedzinski (2008), Andersen (2008), Foxon and Andersen (2009), Urbaniec (2015) and United Nations (n.d.A). Other definitions focus solely on a positive impact on the environment such as the definitions by Kemp and Pearson (2007), OECD (2009), Carrillo-Hermosilla, del Rio and Könnölä (2010), Triguero, Moreno-Mondéjar and Davia (2013), Park, Bleischwitz, Han, Jang and Joo (2017) and European Commission (n.d.A).
This thesis is based on a definition that adds value to both the environment as well as the company. Namely, the definition by James (1997, page 53) whom states that:

*Eco-innovation regards new products or processes that creates value for the company and the customer, while decreasing the impact on the environment markedly*

This definition is specific that it regards the products or the processes and that it adds business value, whereas other definitions that state that eco-innovation adds value to both the business and the environment are broader. In comparison, ordinary innovation can be described as a company’s procedures in change making as well as the adoption and establishment of new ideas, actions and
methods (Crowe & Brennan, 2007). However, note that some authors in the following review of previous literature might use another definition than the one stated for this thesis. Nevertheless, this does not change the outcome of what previous studies have stated regarding barriers to eco-innovation.

The concept of eco-innovation has gained an increase in relevance for academics, practitioners and policy makers since the year of 2007 (Díaz-Garcia, González-Moreno & Sáez-Martinez, 2015). It is an essential aspect in making company processes more sustainable, whether it is to change a process as a whole or only to make an add-on on the existing process to reduce the negative impact on the environment. Eco-innovation can also create job opportunities as a result of cost reductions, growth and increasing productivity generated from new processes and products (Ghisetti, Mazzanti, Mancinelli & Zoli, 2015). In addition, it can lower risks via better safety features and strengthen the brand value (Klewitz, Zeyen & Hansen, 2012).

However, in order for companies to achieve an environmental growth in terms of eco-innovation, they need to be ready to transition to environmental practices by developing new competencies and skills. They may need to change their business models, reallocate capital and resources as well as redevelop their products (OECD, 2010). According to Cecere, Corrocher and Mancusi (2018), the probability that a company implements eco-innovation increases according to the company size, the rise in energy prices and the amount of investments devoted to eco-innovative activities. Moreover, in comparison to non-environmental innovation, eco-innovation requires more knowledge and information (Pinget et al., 2015).

More about the different demands that eco-innovation entails for the companies will be presented in the subsequent sections presenting both the drivers and the barriers to eco-innovation. The focus will however be on the barriers as those are the issue of research. A driver in this thesis, is a factor that incites eco-innovative activities in its diffusion and adoption, whereas a barrier in this thesis, is a factor that delays, obstructs or complicates the transition to and adoption of eco-innovative activities.

2.2. Drivers to eco-innovation

Currently, there are several recurring areas within the existing literature regarding eco-innovation and the most popular area concerns the drivers for eco-innovation (Díaz-Garcia et al., 2015). Prior
research on the drivers of eco-innovation stresses three important categories of factors as drivers to eco-innovation. These are supply side factors, demand side factors and regulation (Hermann & Wigger, 2017; Triguero et al., 2013; Horbach et al., 2012; Sanni, 2018). The supply side factors consist of human and technological capabilities such as access to knowledge and research and development, whilst the demand side factors cover all issues related to the market. Lastly, regulation embraces the environmental policy (Triguero et al., 2013; Horbach et al., 2012; Sanni, 2018).

Regarding the regulatory policy, policy instruments play an important role to why companies decide to eco-innovate on a macro level (Díaz-Garcia et al., 2015) and are key drivers (Triguero et al., 2013; Sanni, 2018). However, on a sub-national basis, regions with a great know-how and dense innovation also have a great impact at the macro level as they work as lighthouses that diffuse the eco-innovation concept (Díaz-Garcia et al., 2015).

Moreover, the market dynamics, pressure groups and networks are factors that drive eco-innovation at a meso level (Díaz-Garcia et al., 2015) and is to be considered demand side factors (Hermann & Wigger, 2017; Triguero et al., 2013; Horbach et al., 2012; Sanni, 2018). However, the demand for eco-innovative products is rather low due to the fact that the products are too costly (Horbach et al., 2012). On the other hand, there are also new studies showing that the customers willingness to pay more for eco-friendly products is increasing. Since the market is expanding there is a driver for firms to launch “greener” products in order to gain market shares (Sanni, 2018; Triguero et al. 2013).

Except for these different drivers on macro and meso level, there is a great dependency on the companies’ resources and capabilities at the micro level (Díaz-Garcia et al., 2015). The resources and capabilities are thus supply-side factors (Hermann & Wigger, 2017; Triguero et al., 2013; Horbach et al., 2012; Sanni, 2018). To exemplify, for a company to be eco-innovative, their personnel needs to have the right competence and the company needs to have a great established network (Diaz-Garcia et al., 2015). Horbach et al. (2012) and Sanni (2018) also mention that knowledge acquired through activities within research and development are fundamental drivers to eco-innovations.
2.3. Barriers to eco-innovation

Eco-innovations have great potential to improve the competitiveness of firms. The concept has however experienced complications regarding its diffusion, mainly because of different barriers (Menezes & Cunha, 2016). The barriers to technological eco-innovation, which focuses on the products, processes and services, in comparison to ordinary technological innovation show to be both of a higher quantity and of greater intense. Due to the complexity that eco-innovation entails, the companies engaging in eco-innovative solutions have to handle a lot more dimensions in comparison to companies dealing with technological innovation (Pinget et al., 2015).

The barriers may also be perceived differently depending on a company’s commitment to the investments in eco-innovation. The perception of barriers and obstacles are thus in relation to a company’s internal resources, position in the market, competency and eagerness to comply to the eco-innovation concept. A company that has invested a lot of money in eco-innovation faces other barriers than a company that has not put a lot of effort to be eco-innovative (Marin et al., 2015). There are also different types of barriers; barriers that are internal to the company and barriers that are external to the company. Moreover, the barriers are usually coherent and interact with each other, which means that they can overlap (Menezes & Cunha, 2016).

The barriers in the subsequent sections of the theory will be presented in the form of three different themes of barrier factors. The themes include barrier factors related to; the company, the products and production, and the diffusion and adoption. In the end of the theory section, these themes will build up the analytical framework.

2.3.1 Barrier factors related to the company

Awareness

The companies’ awareness regarding their activities’ impact on the environment is something that has increased during the recent years. Despite this, awareness regarding the companies’ environmental impact is often a barrier to eco-innovation and several companies still lack awareness concerning all of the benefits of implementing eco-innovation practices in their companies (OECD, 2010). Different companies thus differ in their perception of how beneficial eco-innovation is (Klewitz et al., 2012). It is in general not easy for companies to measure how beneficial eco-innovation is. Traditionally, caring about the environment has been considered a burden rather than an asset for companies (Carrillo-Hermosilla et al., 2009).
Regarding the benefits, there are on one hand, actors on the market who mean that the benefits of eco-innovations do not overcome the costs they bring (Klewitz et al., 2012). Carrillo-Hermosilla et al. (2009) explain this further and state that the environmental externalities not always become internalized by the companies and that they therefore are less likely to take eco-innovative actions. This is based on the fact that a positive environmental impact does not necessarily mean that eco-innovation is beneficial for the companies. It can also entail more costs (Carrillo-Hermosilla et al., 2009) as earlier stated by Klewitz et al.’s (2012). On the other hand, there are authors that argue for the benefits of the company and state that eco-innovation entails increased competitiveness (Wong, 2012) as well as opens up for new market opportunities (Horbach et al., 2012). In addition to this benefit-cost issue, the recognition of the importance of changing to eco-innovative activities tends to be weak (Pacheco, Schwengber ten Caten, Jung, Navas & Cruz-Machado, 2018).

Knowledge, competence and training

In addition to the lack of awareness of the importance and benefits of eco-innovation, several companies tend to have insufficient knowledge (Pacheco et al., 2018; OECD, 2010). In order for companies to be eco-innovative, it requires competent personnel as well as certain skills and information (Pinget et al., 2015). The easier the companies access the right knowledge, the more probable the eco-innovation activities are (Cecere et al., 2018). The knowledge required is demanding for companies to obtain and the competence needed is usually not core competence that companies already have (Pinget et al., 2015). An example of the lack of knowledge is that many companies do not have knowledge of the degree of the transition that needs to be done to align with the eco-innovation concept and the environmental regulations. In the United Kingdom as well as in New Zealand, it has shown that several companies do not know how the environmental regulations are going to impact their company industry. Neither do they know what environmental competencies that are going to be expected from them (OECD, 2010). This is strengthened by Hill (2001), who states that operation managers tend to narrow their focus to their own processes within the company boundaries and thereby not obtain the full picture of the implications that political decisions entail. These can be implications such as costs of permit for companies to issue CO\textsubscript{2} as well as the costs of fuel.

Moreover, in order for companies to reduce their CO\textsubscript{2} emissions, they need to know how much their activities are affecting the environment as well as what other options they have for their different processes and productions that are more environmentally friendly. However, a lot of
firms lack the knowledge of how to change into solutions with less impact on the environment and they also lack an understanding of being agile in terms of consistent change (OECD, 2010). The reason behind this lack of knowledge can be the fact that they have very limited training for eco-innovation as well as the learning-by-doing approach that mostly smaller sized companies tend to have. This learning-by-doing approach, which means that the companies do not learn from an appointed trainer but from performing activities themselves, is not well suited for dramatic shifts in terms of changing to an eco-innovation business model (OECD, 2010).

Circular Economy
The meaning of Circular Economy is to change industrial processes as well as habits regarding consumption to a closed loop system. It is a recirculation of material in terms of reuse of old material for new products (de Jesus & Medonça, 2018). The concept has been stressed by, among others, the EU Action Plan for Circular Economy (European Commission, 2015). However, companies face barriers when implementing this concept such as; high initial costs, an infrastructure that is resource demanding, difficulties in the cooperation between companies as well as scarce interest by consumers (de Jesus & Medonça, 2018).

2.3.2 Barrier factors related to the products and production

Costs and economies of scale
A barrier that is related to the innovation itself is the cost for the companies to produce a more environmentally friendly product (Pacheco et al., 2018). Companies in all sizes with an eco-innovative approach can also face the barrier of the lack of economies of scale for their product production. When it comes to technologies that already exist that are not eco-innovations, they are commonly benefited by economies of scale. This leads to a reduction in costs and to improvements in general. However, when it comes to eco-innovation that can be considered an emerging technology, there is no economies of scale since it is too expensive to adopt an eco-innovation technology. In addition to that, the reason why it is so expensive is because companies do not adopt it. It is thus a downward spiral (Del Río et al., 2010).

Moreover, Carrillo-Hermosilla et al. (2009) found that a company can be reluctant to be the one innovating the eco-solution as this means an incurring of the costs for that innovation upon themselves, while other companies can take part of the result of the innovation without additional
costs due to spillover effects. This entails the risk that other companies do not engage in being innovative regarding eco-solutions themselves as they can make use of others’ work.

**Quality requirements for the product and production process**

Moreover, some companies can be reluctant to change their products to more eco-innovative products as the companies trust the way their items have been produced (Pacheco et al., 2018 & Carrillo-Hermosilla et al., 2009). The old solutions are therefore still live out of old habits (Carrillo-Hermosilla et al., 2009). The companies know that the components and the designs work according to their standards and therefore would have to invest a lot of money to rework something that to them is already good. A new product with new and more eco-friendly formula may not be as good or perform at the same level (Pacheco et al., 2018). There is thus a distrust to new eco-innovative solutions and this stems from a lack of experience with these new solutions. Another barrier for companies to be eco-innovative is that the innovative solutions that already are on the market, tend to be the ones favored. Hence, the solutions that apply already existing technology are the favored solutions (Carrillo-Hermosilla et al., 2009).

**Customer demand for the products**

Furthermore, regarding customer demand for the products, an additional barrier is the challenge of changing consumers' views on eco-innovative solutions (Jasiński & Tužnik, 2013). Due to the eco-innovative products’ newness in comparison to other products, there is a certain level of uncertainty in their market (Pinget et al., 2015). Some companies state that the customers do not want eco-innovative products and that it is irrelevant for them (Klewitz et al., 2012). In addition, the eco-innovative companies’ consumer markets tend to be volatile (Pinget et al., 2015). In order for a consumer to redirect the demand from a company’s previous product to an eco-innovative one, the firm must succeed in changing the individual's mindset and priorities, which is a difficult challenge (Jasiński & Tužnik, 2013). The environmental benefits that the eco-innovative products have are often not identified easily by the customers. Moreover, it is not uncommon for customers to be reluctant to pay extra for an environmental product (Pinget et al., 2015).

**Internal financing**

The access to capital that can finance eco-innovation is crucial for eco-innovation to be implemented and it is one of the greatest challenges for many companies (OECD, 2010) The difficulties differ according to the size of the company (Cecere et al., 2018) and so does the performance (Aragón-Correa, 1998). Large companies are more likely to invest in sustainable
R&D while smaller companies’ financial resources tend to be scarce (Cecere et al., 2018). The lack of financial resources entails that the investments in eco-innovation cannot be covered (Pinget et al., 2015). Costs are often too high for eco-innovation to be implemented. These comprise costs of adapting environmental benefits to the company as well as measures and managing procedures (Pinget et al., 2015). In addition, it is not uncommon for some companies, especially companies of smaller size, to work with low profit margins (Pacheco et al., 2018), which has a negative impact on the companies’ internal cash flows (Gartenstein, n.d.) and pushes eco-innovation further down on the agenda (Pacheco et al., 2018). Connected to this is that the smaller companies also tend to endure a lack of equity (Cecere et al., 2018).

Credit institutions’ view of risk
The problem with the financing of eco-innovation can partly be explained by the difficulty for companies to be funded (Halila & Rundqvist, 2011) as well as the difficulty in finding credit opportunities (Ghisetti et al., 2015). Regarding the funding, Carrillo-Hermosilla et al. (2009) state that decisions concerning investments are commonly based on investments made earlier as well as experiences with the issue that needs funding. Moreover, Ghisetti et al. (2015) state that the current financial market benefits companies with short-term goals which entails an indirect discouragement of eco-innovative companies as they are focused on long-term profit. Eco-innovation investments are also still characterized by a higher risk. This is due to that eco-innovation technologies still are in an incipient phase as well as to performance uncertainties. These factors along with the low risk to invest in high carbon technologies make eco-innovation investments a risk/return trade-off. It is still more profitable to invest in high carbon options as eco-innovation investments, for instance, have high capital costs. This leads to a situation in which credit institutions keep on granting credits to companies that make conventional investments while there is a shortage of credits to companies making eco-innovative investment with longer payback period. One explanation to the shortage of granted credits to eco-innovative investments is the financial institutions’ short-term mindset that does not play well with the eco-innovative companies’ uncertain return on investment and long payback periods. These barriers hence reduce the possibilities for companies to be eco-innovative (Ghisetti et al., 2015).

2.3.3 Barrier factors related to the diffusion and adoption of eco-innovation

Regulations
The negative impact inflicted on the environment due to pollutions is widely stated. Debates are held regarding how to handle this problem among the corporate sector, governments and other non-governmental organizations and environmental pressures will undoubtedly continue to stress action among operating managers (Hill, 2001). However, for many companies, environmental pressures can be troublesome. It can be hard to respond to new regulations as some companies may not have the right competences to be able to respond quickly to changes. Some companies struggle to retrieve all of the needed information, adapt their processes and products to the regulation and also to understand what implications the new regulations have for their company (OECD, 2010). Regarding this slow response to regulations, Pacheco et al. (2018) state that especially small size companies tend to be reactive to market changes instead of proactive. Moreover, in some countries, the legislation may be inconsistent (Pacheco et al., 2018).

Companies engaged in eco-innovation can find continuous adjustments to legal regulations a major problem which makes it difficult for them to introduce innovative solutions. Situations like these require the companies to constantly update their information of their legal rights, which makes it difficult to prepare business plans in the long term and to implement them in accordance with previously made decisions (Jasiński & Tużnik, 2013).

**Market structure and competition**

Except for barriers regarding regulations and legislation, there are barriers regarding the markets (OECD, 2010; Jasiński & Tużnik, 2013). The markets for eco-innovative companies are commonly complex and they develop rapidly. This is an issue for the companies that they need to concentrate on (Pinget et al., 2015). Except for the complex and rapidly developing eco-innovative markets, the competition is a barrier too. This competition is mainly as a result of the large international companies’ power, ability to control the market and their setting of the rules. This makes it hard for smaller companies to be attractive on the market with their new innovative products or processes. Increasing competition on the market also means that consumers get access to more substitutes, which may reduce the market value of the company's eco-innovative product. Increasing competition also enlarges the companies’ marketing costs as the need to create customer demand increases with the competition (Jasiński & Tużnik, 2013).
2.4. Analytical framework

The analytical framework in this thesis is inspired by Halila and Rundqvist’s (2011) analytical model. They analyze the success factor in different phases of the innovation process. However, this thesis uses a modified version of their analytical model, that is adjusted to analyze the barriers to eco-innovation. Therefore, the barriers presented in the three different themes in the theory section, namely the barriers related to; the company, the products and production, and the diffusion and adoption, will constitute three themes in the analytical framework presented in Figure 1. From these themes, the main barriers to eco-innovation will be extracted.

In order to conclude the main barriers, we chose between different perspectives on what to consider a main barrier. Either a main barrier could be based on that it was shared by the greatest amount of companies in the empirical data collection. Or, a main barrier could be the barrier that showed to be of the greatest magnitude. This thesis takes the first perspective. This choice assumes that barriers stated by several companies are more common than barriers stated by only one company. Regarding the latter perspective, the estimation of a barrier’s magnitude seems more arbitrary. The analytical framework is presented in Figure 1 and will be the basis for the analysis.

![Analytical framework](image)

*Figure 1: Analytical framework*
3. Methodology

The method section will encompass the choices made regarding our point of departure in terms of our interpretation of data, our relationship between the theory and research, our research method, our data collection and analysis method.

3.1. Research philosophy

Epistemology is the doctrine of knowledge. It studies how knowledge is created and what individuals have knowledge of (Söderbom & Ulvenblad, 2016). During the process of this thesis, the aim was to create an understanding of the barriers to the eco-innovation concept in the manufacturing industry and thus create new knowledge. We wanted to obtain further knowledge of the concept by finding out what the concept means for the people that are involved with eco-innovation and familiar with the concept. During the process, several respondents were interviewed. The interpretation was then based on the respondents’ different perspectives and subjective experiences. These different perspectives and subjective experiences of barriers to eco-innovation were then sought to be understood. This means that interpretivism was applied and contributed to the completion of this thesis. According to Bryman and Bell (2015), interpretivism claims knowledge from the reality, primarily obtained through social constructs such as language and people's perceptions of reality.

3.2. Research theory

In order to understand the barriers to eco-innovation and the barriers’ impact, this study applied an inductive approach when it comes to interpreting the relationship between theory and research. This choice was motivated with the help of Bryman and Bell (2015) who state that an inductive approach presents a theory as a result of the empirical study. This was in accordance with this thesis’ course of action. The intention for this study was to first gather information about the field of research in terms of interviews and literature review and then analyze the findings. Patterns in the collected data sample were searched for to find relationships that can be applied and generalized to a broader population in order to generate theories that can be applied to the study’s research question. This is also consistent with Woo et al.’s (2017) interpretation of induction, they state that induction concerns the generalization of results.
3.3. Research strategy

To achieve the study’s purpose, an exploratory study was performed. This type of study was selected since we wanted an enhanced understanding of eco-innovation and its barriers. According to Saunders et al. (2016) an exploratory study is useful when additional knowledge and an increasing understanding of a specific topic is desired. In addition to the exploratory study, this thesis applied a qualitative method. Bryman and Bell (2015) state that the qualitative method is the most suitable when deeper expertise about a phenomenon is desired. This is strengthened by Yin (2011) who states that it is possible to realize accurate and in-depth studies with this kind of research strategy. A qualitative research method therefore suited this thesis the most since the emphasis was to thoroughly examine the concept of eco-innovation and its barriers. This was done with the help of the study’s respondents and their interpretation of eco-innovation. This research method was also considered the most suitable since the study emphasized the significance of words rather than quantificational connections, which according to Bryman & Bell (2015) is a characteristic of a qualitative study.

The criticism of the qualitative research method questions how generalizable the result in a qualitative study is as the data collection often only shows a small sample (Bryman & Bell, 2015). This study focused only on one industry and it would have been more generalizable if the study was carried out over several industries. However, the industry chosen was suitable as we could interview companies from different sectors of the manufacturing industry such as steel, kitchen and furniture. It is also an industry with great emissions that affect the environment (OECD, 2010). Moreover, there is an awareness that the study may not represent the entire picture regarding barriers for large companies because of the relatively small sample. The criticism also claims that qualitative studies often become too subjective and create problems when it comes to the replication. This is because it is entirely up to the researchers to interpret and determine the significance of the data collected (Bryman & Bell, 2015). According to Bryman and Bell (2015) changes in trends and the difficulty to accurately recreate social conditions can also make it difficult to precisely recreate qualitative studies. Therefore, information regarding the study’s data collection and a thoroughly review of the choices made is presented in the next subchapter. This, in order to create the best possible prerequisites for a possible replication.
3.4. Data collection

According to Bryman and Bell (2015), the collection of data is the key point for all research projects. In order to study how large manufacturing companies work with eco-innovation, primary data from interviews has been collected. In qualitative interviews, the focus is on the respondents’ own perceptions and thoughts on the topic (Bryman & Bell, 2015). Therefore, based on the purpose of the study, interviews were considered suitable since a deeper understanding of the barriers to eco-innovation in the manufacturing industry were requested.

For this study, semi-structured interviews were conducted. According to Denscombe (2016), one of the advantages with this type of qualitative interview method is the adaptability, as follow-up questions can be asked. With this method, the respondents also have the freedom to express their view on areas that themselves think are important (Denscombe, 2016). The semi-structured interview differs from both the structured and unstructured interview. Unlike the unstructured interviews, the semi-structured has predetermined questions and issues to be discussed during the interview. Moreover, unlike the structured interviews, semi-structured interviews are more flexible compared to the structured interview (Bryman & Bell, 2015).

In order to achieve the purpose of the study, the companies chosen had to attain certain criteria. First of all, the companies needed to have a minimum of 500 employees and a turnover of minimum 500 MSEK, since that is what the European Commission (n.d.B) considers a large company’s size to be. They also needed to operate in the manufacturing industry and be engaged in eco-innovative activities. With this in mind, a search for suitable large companies in the manufacturing industry that engaged in eco-innovation began. Subsequently, a convenience selection was made as the sample consisted of companies available at the time (Bryman & Bell, 2015). This resulted in nine multinational manufacturing firms as our primary data. The companies had a minimum of 500 employees and a minimum turnover of 2200 MSEK. However, most of the companies were a lot bigger than that in terms of employees and turnover. To provide anonymity, the firms were named Firm A, B, C and so forth.

After the selection of firms, contact was made with suitable employees at each company. To avoid lack of informed consent and deception, which entail to not mislead the study participants concerning the purpose of the study (Bryman & Bell, 2015), the goal of the research as well as other general information regarding the research process was fully transparent when contacting
potential respondents. In addition, the interview questions (Appendix 7.2), were sent in advance in order to reveal which areas that would be treated during the interview. The interview questions were based on the operationalization in Table 3 in Appendix 7.1. This was done in order to ensure that the interview questions were relevant to the study and had a connection to the concepts in the theoretical chapter. Contact was then made with senior executives and managers within appropriate areas such as sustainability and innovation. According to Denscombe (2016), an important part of qualitative research is the safety of the respondents and that they should not experience any harm from participating in a business research. It is also important to be aware of that the respondents may have been biased on behalf of the company to talk well about the organization and hence not announce any major challenges (Denscombe, 2016). Both these issues were attempted to be avoided by anonymizing the respondents. All respondents in this study was therefore called Respondent A, B, C and so forth. In total twelve interviews were performed, and they lasted on average 40 minutes. Several of the respondents did not have time for a personal meeting or were located in a geographical location far from ours, which meant that telephone interviews were best suited for both parties. If a respondent had time and was located in our vicinity, a physical interview was performed. Table 2 shows an overview of the study’s primary data collection.
The interviews were always attended by both of us, where both asked questions. The questions in the interview guide were in advance divided between us in order to create a continuous flow during the interview. The person who did not ask questions, made field notes regarding thoughts and reflections on the respondents’ answers. The starting point when conducting interviews was that they should be recorded in order to make it easier to go through and compile the data afterwards. If this was the case the interviews could be carefully reviewed, and no data went missing. However, one of the respondents desired to not be recorded. In this case, the respondent’s desire was of course respected. The respect of the participants’ privacy is seen as a significant ethical issue according to Denscombe (2016). In this case, field notes were made by both researchers.

<table>
<thead>
<tr>
<th>Companies</th>
<th>Industry Sector</th>
<th>Respondents</th>
<th>Position in the Company</th>
<th>Type of Interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company A</td>
<td>Kitchens</td>
<td>Respondent A</td>
<td>Head of Group Sustainability</td>
<td>Telephone Interview</td>
</tr>
<tr>
<td>Company B</td>
<td>Consumer Durables</td>
<td>Respondent B</td>
<td>Vice President of Sustainability Affairs</td>
<td>Telephone Interview</td>
</tr>
<tr>
<td>Company C</td>
<td>Steel</td>
<td>Respondent C</td>
<td>Vice President of Sustainability &amp; Public Affairs</td>
<td>Telephone Interview</td>
</tr>
<tr>
<td>Company D</td>
<td>Hygiene &amp; Health</td>
<td>Respondent D</td>
<td>Senior Vice President Group Sustainability</td>
<td>Telephone Interview</td>
</tr>
<tr>
<td>Company E</td>
<td>Industrial Equipments</td>
<td>Respondent E</td>
<td>Product Compliance Manager</td>
<td>Physical Interview</td>
</tr>
<tr>
<td>Company F</td>
<td>Bearings &amp; Seals</td>
<td>Respondent F1</td>
<td>Manager Product Stewardship</td>
<td>Telephone Interview</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Respondent F2</td>
<td>Knowledge Area Manager - Sustainability Performance</td>
<td>Telephone Interview</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Respondent F3</td>
<td>Manager Group Environment, Health &amp; Safety Process Development</td>
<td>Telephone Interview</td>
</tr>
<tr>
<td>Company G</td>
<td>Furnitures</td>
<td>Respondent G</td>
<td>Business Change Manager Circular Innovation</td>
<td>Physical Interview</td>
</tr>
<tr>
<td>Company H</td>
<td>Locks &amp; Safety</td>
<td>Respondent H</td>
<td>Director Global Innovation</td>
<td>Telephone Interview</td>
</tr>
<tr>
<td>Company I</td>
<td>Floors</td>
<td>Respondent I1</td>
<td>R&amp;D Manager</td>
<td>Telephone Interview</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Respondent I2</td>
<td>Senior Vice President Global Marketing &amp; Communication</td>
<td>Telephone Interview</td>
</tr>
</tbody>
</table>

**Table 2: Overview of primary data collection**
during the interview where the most important statements were noted. Afterwards these notes were compared in order to see if the information had been perceived like-minded or differently. According to Denscombe (2016) this means that answers may to some extent have been affected by the authors’ interpretations and memory.

Secondary data has also been collected. The secondary data in this study mainly consists of annual reports and sustainability reports from the different firms. The reports were collected through the firms’ websites. Secondary data was applied to the study in order to achieve triangulation. According to Bryman & Bell (2015) triangulation signifies the usage of multiple sources of data when studying a social phenomenon with the aim to attain greater confidence in the study's outcome. The main purpose with triangulation is not necessarily the cross-validation of data but rather to observe the phenomenon through different angles (Denscombe, 2016). Denscombe (2016) also states the importance of corroborating data gathered through interviews to provide back-up for the respondents’ statements which also was done by triangulation. However, the use of secondary data was limited as the annual reports as well as the sustainability reports did not always provide information regarding the companies’ challenges and barriers. Therefore, only two reports were used as secondary data in this study.

3.5. Data analysis

The initial step when processing the primary data from the interviews was the transcription of all collected data in order to make it easier to process and compare the transcribed interviews with each other. This also allowed for the collection of precise quotes. The quotes were later used to illustrate and highlight important findings in the thesis. The interviews were all performed in Swedish and therefore they were also transcribed in Swedish. This choice was made to prevent data from disappearing during translation. Each transcript was then read through carefully, to receive a comprehension of the firms and their perceptions of barriers to eco-innovation. The next step in the data analysis was to summarize the main takeaways and key points in every interview. According to Saunders et al (2016), summaries of large text pieces enable the authors to become acquainted with the text’s primary themes. This is essential when working with qualitative data, consisting of big volumes of text (Saunders et al., 2016). The transcribed text was then structured and divided into different themes and then various barrier factors. These themes and barrier factors originated from the analytical framework in Figure 1. The different barrier factors could then be broken down into individual barriers. An example of the arrangement regarding the categorizing
and coding can be seen in Figure 2. According to Bryman and Bell (2015), this way of coding data facilitates the work regarding the identification of different patterns and themes. The different categories were also coated with different colors to make it easier to distinguish categories from each other and to be able to remove parts that did not contribute anything to the study.

**Figure 2: Scheme of coding**

The empirical findings were then thematically presented, analyzed and compared with previous literature. The themes are based on the analytical framework in Figure 1 and the operationalization of the different barrier factors to eco-innovation. The operationalization was developed with the help of the prior literature in the theoretical chapter in order to ensure that there is a link between the study’s analytical framework and the empirical result. The operationalization can be seen in Table 3 in Appendix 7.1.
4. Results and analysis

The analysis and results from the empirical findings will be portrayed according to the analytical framework presented as Figure 1 in the theory section. Here, it is worth noting that the point of departure is that a main barrier in one of the three themes (Barrier related to; the company, the products and production and diffusion and adoption) is a barrier stated by the greatest amount of companies. This choice was explained along with the explanation of the analytical framework in section 2.4.

To facilitate the comprehension of the structure of this chapter even more. The chapter is first of all divided into the three themes mentioned in the earlier paragraph. The themes are in turn divided into barrier factors, such as Awareness and Circular Economy. Lastly, these barrier factors are divided into separate barriers.

4.1. Barriers related to eco-innovation

4.1.1 Barrier factors related to the company

In order to provide a better conception of the analysis, the subsequent barrier factors are structured according to barriers that were shared among the greatest amount of companies. Therefore, the barrier factors will begin with Awareness, that will be followed by Circular Economy and Knowledge, competence and training.

**Awareness**

The barriers that will be presented connected to the Awareness factor for the large manufacturing companies can be divided into the barriers; *the awareness of the eco-innovation concept’s benefits, what eco-innovation implicates for different business areas in a company, how to translate eco-innovative requirements to technical terms* as well as that *the awareness concerning eco-innovation differs in different countries*.

*The awareness of the benefits of eco-innovation* was the greatest awareness barrier and also the greatest barrier that related to the company, stated by five out of nine companies. Thereby, it seems like a lot of large companies have this barrier in common. In the theory it is stated that eco-innovation entails benefits such as more job opportunities due to cost reductions as well as an increase in growth and productivity (Ghisetti et al., 2015). However, Company B and E stated that it always is a tradeoff to take a stand for. Respondent B explained it as a tradeoff in which
environmental aspects need to be taken into consideration together with quality, delivery precision and customer groups. Moreover, Respondent F3 stated that:

“It is a challenge to work with environmental considerations when there is no clear connection to profit”

This was also upheld by Company H and G, who stated that they need to see financial benefits with the environmental considerations for the considerations to be easily implemented in the company. Regarding the benefits of eco-innovation, Klewitz et al. (2012) state that companies can differ in their perception of how beneficial eco-innovation is. Some companies simply think that the benefits do not overcome the costs.

The statement that environmental considerations are hard to implement when there is no clear connection to profit can be connected to Carrillo-Hermosilla et al.’s (2009) statement that environmental externalities do not always become internalized by companies, which can lead to that the companies do not adopt the eco-innovation concept. A positive impact on the environment does not automatically entail a positive impact on the company (Carrillo-Hersmosilla et al., 2009). Here, one must take notice of the thesis’ definition of eco-innovation. Eco-innovation entails a positive impact on both the financial results and the environment, as stated by James (1997) in his article.

Therefore, one can conclude that the companies do not want to consider the environment solely, without taking the financial results into account. They want to consider both, which means that they want to be eco-innovative. However, the large companies do not seem to be sure of what actions that are eco-innovative and what actions that only benefit the environment. Carrillo-Hermosilla et al. (2009) state that eco-innovative solutions are new and that there is a lack of experience in this area of eco-innovative solutions. This could explain why there still seems to be doubts regarding how the companies’ environmental choices will affect them financially. They still seem to need time to build up their awareness on how their environmental choices are going to be eco-innovative in terms of being related to not only the environment but profit as well.

The other barriers concerning the barrier factor Awareness were not shared among several companies. These barriers were: what eco-innovation implicates for different business areas in a company, how to translate eco-innovative requirements to technical terms as well as that the
 awareness concerning eco-innovation differs in different countries. They were also not found in the previous studies.

Regarding the barrier what eco-innovation implicates for different business areas in a company, Company F stated that they saw a barrier concerning knowing what eco-innovation meant for all different areas of the company in terms of what actions that need to be taken in each area.

“The challenge is to grasp the sustainability issues and understand what they mean for myself and for my job at my department. What is it in a concrete way that I can do?”

- Respondent F1

Moreover, they stated that it can be hard to translate eco-innovative requirements into technical terms for the product developers to follow (Respondent F2). The last awareness barrier was stated by Company H that experiences a barrier regarding that the awareness within the company can differ in different countries. In countries such as India and China, the awareness can be lower as the environmental requirements are different there.

“If we look at India and China, there is not the same awareness I would say. It is not as they are not interested but the awareness does not exist in the same way and the requirements have been different”

- Respondent H

Those were thus the different Awareness barriers found from the companies interviewed. When comparing the empirical findings regarding the barrier factor Awareness to the theory, there are some differences. Unlike what is stated by Pacheco et al. (2018), the empirical findings did not suggest an awareness barrier concerning the importance for companies to change to an eco-innovative approach. Except for a different perspective that came from Company I, stating that it is hard to tell if the current environmental considerations really are going to be as addressed in the future (Respondent I1 & I2). Other than that, the empirical findings showed that the large manufacturing companies are well aware of that eco-innovative changes need to be done, as changing to an eco-innovative approach is a very addressed issue. For instance, Respondent E stated that:
“The awareness exists on a high level in the company I would say. Our management is well aware that this (eco-innovation) is important and that we need to incite these activities”

This suggests that the awareness of the necessity to change among the large companies is great. Regarding this, Diaz-Garcia et al. (2015) state that there is an increase in relevance for practitioners to be eco-innovative. This seems to be true among the companies from the empirical findings.

Based on the barriers regarding the Awareness factor, one can thereby conclude that the barrier regarding the awareness of eco-innovation’s benefits is a main takeaway among these as this was the one shared by the highest number of companies. This may not be surprising as Carrillo-Hermosilla et al. (2009) state that it is in general not easy to measure the benefits of eco-innovation.

Circular Economy

The next barrier factor relating to the company that regards Circular Economy did not show to be shared by as many companies in the empirical findings as the Awareness factor. The Circular Economy barrier factor with the barrier, cooperation and coordination, turned out as a barrier shared by four companies. The barrier means that cooperation and coordination is needed in the society for companies to fully engage in Circular Economy.

According to Company A, E, D and G, it is a challenge to establish a business model characterized by Circular Economy. As an example, Company G stated that they want to become circular until the year 2030 and only use renewable and recycled material, which is a great exertion for them. Moreover, Company A, E and D stated a problem regarding the need for cooperation for Circular Economy to be established. For instance, Respondent A states that:

“In order to change to circular economy, changes in the infrastructure need to happen in order to secure that there is no waste. I think that many industries thread water regarding Circular Economy. They are waiting to find opportunities to start small-scale projects. However, large-scale projects require cooperation between sectors and this entails costs”
This challenge with the need of cooperation for large Circular Economy projects to be established is shared with Company E and D. It is not possible to work with Circular Economy alone (Respondent A, E & D). An example of this was explained by Respondent E. S/he stated that Company E started a project to improve the battery recycling from their products as this was requested by their customers. Therefore, they started investigating battery recycling in general. As an example, they looked at what the EU directive stated regarding battery recycling and found out that Sweden does not reach the goal for the volume of batteries that needs to be recycled. In order to try to contribute to this goal they were in contact with the EU-commission. However, it was unsuccessful as the EU commission said that Sweden is doing well in battery recycling in comparison to other countries. Company E thereby concluded that no matter how much they want to improve their battery recycling, the recycling cannot improve if there is no coordination and cooperation established in the society.

This Circular Economy barrier factor regarding cooperation and coordination is strengthened by the theory which states that difficulties in the cooperation between companies is one of several barriers when going to a circular business model. The theory also stated additional barriers regarding Circular Economy that were not mentioned by the large companies interviewed such as scarce interest by consumers (de Jesus & Medonça, 2018). Regarding the interest by consumers, the empirical findings rather suggest that the interest by the consumers influenced a focus on a circular business model. Thereby, the interest by consumers rather is a driver for the companies in the empirical findings.

Based on this, the barrier for the large companies concerning Circular Economy can be concluded to be the coordination and cooperation in the society, among companies as well as between companies and the European Commission. These coordination and cooperation projects seem to also be the actions that can pave the way for a future with circular business models for the companies.

Knowledge, competence and training
The last barrier factor that relates to the company is concerned with Knowledge, competence and training. This was the barrier factor that constituted as the smallest barrier relating to the company as it was shared by the least amount of companies. The barriers we found connected to Knowledge, competence and training were barriers concerning; the diffusion of competence in the organization, the competence to be proactive in relation to the regulations and the adjustment to a new way of
working for the employees. Two companies shared a barrier concerning the diffusion of the competence to all parts of the organization. This was mentioned by Company E and H. As an example, Company H stated that:

“In countries where our company is not as well-known and established, the knowledge and competence can be scarcer”

- Respondent H

Furthermore, Company E stated that one person with competence cannot be at all places at once. This makes it really important that the knowledge encompasses the whole organization.

The other barriers connected to the barrier factor Knowledge, competence and training, that concern the competence to be proactive in relation to the regulations and the adjustment to a new way of working were not shared with other companies in the empirical findings. Respondent B stated that it can be a challenge for Company B to make sure that they have the right competence that not only enables them to keep up with the legal requirements, but also enables them to make eco-innovative developments that are not a requirement yet. Respondent B thus stated:

“It can be a challenge to ensure that the employees have the competence needed to be proactive in the relation to regulations”

This challenge is not surprising as it can somewhat be strengthened by the theory. The theory states a problem with obtaining the right competence (Pinget et al., 2015). However, the theory seems to refer to a competence on a more basic level, rather than a level that enables a company to be proactive. Lastly, Company F mentioned a barrier for some employees that have worked at Company F for a very long time with a certain working approach. They can find it challenging to readjust to a new way of working that is suited for eco-innovation in terms of taking new parameters into account (Respondent F1).

The three barriers mentioned concerning competence differ from what is stated in the theory. While the empirical findings suggested slight barriers with competence, the theory illuminated great problems (Pacheco et al., 2018; OECD, 2010; Pinget et al., 2015) with even obtaining the right competence. The competence needed is according to the theory not something that usually is included in the core competence of the company and it is also hard to obtain (Pinget et al., 2015).
It can, for instance, be difficult to know how environmental regulations are going to affect the company. Another problem that is stated in the theory is insufficient training in eco-innovation. Due to these problems, many companies lack the knowledge of how to decrease their environmental impact (OECD, 2010).

When it comes to the barriers related to the competence, there were thus no barrier, among the studied companies, that was represented by a majority of them. This suggests that competence seems to be a small challenge for large manufacturing companies. The only barrier that some companies had in common was the one with the diffusion of knowledge to the whole organization. However, as this barrier only was stated by Company E and Company H, it is difficult to say if large corporations in general experience this barrier. OECD (2010) stated that there is limited training regarding eco-innovation for many companies and this could explain why there can be inconsistencies in the degree of competence in different parts of the companies.

Main barrier related to the company

Now that all barrier factors relating to the company have been presented, one can see that the Awareness factor constituted as the barrier factor in which most companies shared a barrier. This barrier was that the awareness of eco-innovation’s benefits can still be low among the large manufacturing companies. Therefore, this barrier attains a position as a main barrier as one can see in Figure 3. Figure 3 illustrates one of the three components in the analytical framework, Figure 1. It shows which of the barrier factors as well as which particular barrier that was the main one of the barriers relating to the company.
4.1.2 Barrier factors related to the products and production

The barrier factors related to the products and production will be analyzed the same way as the barrier factors related to the company. Hence, the barrier factor in which the highest number of companies shared a barrier is presented first. It turns out that the barrier factor shared among the highest number of companies regards Quality requirements for the products and production process. This barrier factor will be followed by the factor Demand for the products, which had the second highest number of companies sharing a barrier. Lastly, the factors Costs and economies of scale and Financing will be presented.

**Quality requirements for the products and production process**

The barriers connected to the barrier factor Quality requirements for the products and production process encompass the barrier *transitions*, which turned out to be the main barrier among the
barriers related to the products and production. The barrier means that it is challenging for the companies to transition to new processes appropriate for eco-innovation. Thereafter, the second barrier will be presented, namely, the *choice of environmental material*.

Regarding the *transitions*, the production processes and facilities are areas in which change can be needed when changing to the eco-innovation concept. This is stated by Company B, C, G and E. These changes are in the form of great transitions that constitute a barrier for the companies stated above. In fact, these great transitions turn out to be the greatest barrier regarding the barrier factor Quality requirements for the products and production process. For instance, Company B has a long history of gasoline driven products and they want to become fossil-free. Likewise, Company C wants to develop a completely new steel manufacturing process in which they can produce steel that is fossil-free. The current manufacturing process that Company C has under operation, has been the same since the 14th century which makes this transition radical and challenging.

“Today’s processes that create steel do not work if we want to become fossil-free. Therefore, we are developing this sector from its core and that is a challenge [...]. As stated before, we need to develop a new steel manufacturing process and the current process has been the same since the 14th century. Hence, it is a relatively great challenge.”

- Respondent C

Moreover, Company G is underway with transitioning to the use of only recycled and renewable materials for their products and Company E wants to transition to renewable electricity where they have their operations as they want to decrease their CO₂ emissions, but renewable electricity can be hard to access (Atlas Copco, 2018). Regarding Company G’s transition to recycled and renewable material, Respondent G states that:

“There are simply not enough resources in the world for us to grow and continue doing the business activities we do. We have committed to a goal for the year 2030 that implicates that all our products should be based on renewable and recycled material”
Hence, in order for Company B, C, G and E to fully become eco-innovative in their production and assembling of their products, radical transitions are required which constitute a difficult barrier for their eco-innovative development. This is confirmed by OECD (2010), stating that in order for companies to be eco-innovative, they need to prepare for transitions to environmental practices. This might be in terms of new business models, reallocation of capital or redevelopment of products. Although not stated by the companies interviewed, these transitions seem to be an issue that can entail delays for the establishment of an eco-innovation concept in the companies as they seem very time consuming. The transitions supposedly require lots of resources in terms of man-hours and capital, which probably is very challenging.

Another barrier that was not expressed by as many companies regarding the Quality requirements for the products and production process concerns the choice of environmental material. This is stated as a barrier by Company H, E and B. For instance, Respondent E states a drawback concerning the choice of environmentally sustainable material. Namely that if they want to use sustainable material for their products, the material might need to be thicker in order to not break, which in turn entails a negative impact on the environment. Likewise, Respondent H states a similar problem that regards that the durability of the products can become worse when changing it to eco-innovative.

“We have developed a new product line in which the products are more environmentally sustainable than other products. However, there are other product attributes that become worse due to that the products are produced from a sustainability perspective. The products may for instance become less durable”

- Respondent H

Hence, one alternative material may have significant green qualifications from one angle but may be less appropriate from another angle. Therefore, it is a challenge to identify the best choice of material for a product (Assa Abloy, 2018; Respondent E). Moreover, Respondent B states that it is hard to say if one material is better than another material in a life cycle perspective. Based on this, one can see that Company H, E and B, on their journey to become more eco-innovative, find it challenging to choose environmentally friendly material that will maintain the same product performance as the old version of the product. This could be explained by Carrillo-Hermosilla et al. (2009) who state that there is a distrust to eco-innovative solutions as there is still a lack of experience with these solutions. The lack of experience can thus potentially be the reason why the
companies struggle with their choice of material. The theory also states that companies can be reluctant to change their products to more eco-innovative products as they do not want to risk that the reformed product does not perform as well as the old product (Pacheco et al., 2018). However, unlike what was stated by Pacheco et al. (2018), it does not seem like Company H, B or E would be reluctant to become more eco-innovative because of quality requirements of the products as this never was expressed by them. Rather, it seems like the change to eco-innovative materials can have delays as it seems to take time to identify the best choice of material.

**Demand for the products**

The barrier factor Demand for the products had the second highest number of companies sharing a barrier among the barrier factors related to the products and production. This barrier factor includes one barrier that concerns *making eco-innovative products an easy choice* in terms of price, quality and performance. At the same time, the demand for eco-innovative products seem to be increasing, based on the empirical findings. Company F states that a lot of times, their customers place an environmental demand on their products before a regulation regarding that environmental demand has come into force.

“It is very customer incited. Our customers demand changes before the changes become regulations. It is pretty dynamic, and it is a challenge to respond to the demands”

- Respondent F2

Likewise, Company A and Company B can also see an increased demand for eco-innovative products. Company A states that:

“The customers have a lot more requirements now on sustainability performance concerning the products. It is a lot more focus on sustainability from all interest groups in comparison to a couple of years ago”

- Respondent A

Moreover, Company B states that the customers demand eco-innovative products in terms of technology that is smarter when it comes to the environment. The pattern among the large companies thus seems to be an upswing in the demand from the customers when it comes to eco-innovative products. This differs from the theory that emphasizes a barrier regarding changing the
customers’ opinions concerning eco-innovative solutions (Jasiński & Tuźnik, 2013). Pinget et al. (2015) state that as the eco-innovative products are new to the markets, there is a certain level of doubt regarding those products. The theory also states that the eco-innovative markets tend to be volatile (Pinget et al., 2015) and that eco-innovative products are not in the interest of their customers (Klewitz et al., 2012). The only company that confirmed this theory was Company H, who said that there is no great demand for eco-innovative products yet and that it is a matter of communication of the benefits of eco-innovative products to the customers that is needed.

“The demand is not very big yet and I mean that this is a matter of communication. If one communicates the benefits with eco-innovative products, one creates a demand. I think that most of us wants to be environmentally friendly and therefore I think that it is an education issue among the customers somehow”

- Respondent H

This leads in to the challenge expressed by several of the companies concerning making eco-innovative products an easy choice when customers choose between an ordinary product and an eco-innovative one. Respondent B states that it should be easy for the customers to choose sustainable options before other non-sustainable options and that it needs to be a simple task. For instance, s/he states that:

“When customers make their choice, they take many parameters into account. One of those parameters is the environment. However, we want to make the customers to easier make the right choice (the eco-innovative choice)”

S/he thinks that all individuals make their own decisions at the purchase moment. Further, s/he states that s/he does not personally always pick the environmentally friendly product, s/he bases the decision on the price and the location of production. There are many different customer groups, some prefer sustainability whereas some does not have any preferences regarding sustainability as they rather consider, for instance, quality and performance (Respondent B). A challenge in making eco-innovative products an easy choice is therefore to make environmentally friendly products that are not more expensive than other products on the market (Respondent D).
“We consider it a challenge that environmentally friendly products must not be more expensive on the market (than other products), if so we have done wrong. We must make sure that people can afford to buy the eco-innovative products”

- Respondent D

If the product is too expensive, then it might not fulfill its purpose because of the risk of not being bought which makes it occupy storage area (Respondent H).

“If it is too expensive, the products become a shelf warmer and then we have not achieved anything”

- Respondent H

Hence, customers should not have to opt out eco-innovative products because of an issue such as the products’ price (Respondent D & H). The empirical findings about the large companies thus suggest that the demand for eco-innovative products is for the most part increasing, but they still need to make eco-innovative products an easy choice in terms of price, quality and performance, which can be a challenge.

Costs and economies of scale
The barrier factor Cost and economies of scale was only mentioned as a problem by one of the companies. The only barrier included in this barrier factor is lack of economies of scale. In general, the large companies did not seem to have troubles with costs when it comes to eco-innovation. As stated before, a majority of the companies rather expressed a problem with choosing eco-innovative alternatives in cases where they were not aware of the benefits (Respondent B; E; F1; F3; G & H). However, Respondent B stated that a lack of economies of scale regarding environmental products can be a cost barrier. The high costs that bio-based products entail will not be reduced until the volume of the bio-based material increases on the market.

“This is a challenge for very many companies. Especially the companies that develop the new materials since they have a hard time to launch them on the market. Not until one can launch a higher volume of materials on the market one can reduce the costs for them”

- Respondent B
Respondent B further states that the lack of economies of scale is a reason why it takes time for companies to readjust to eco-friendly material. For instance, the battery cells were a lot more expensive for ten years ago. Now the costs have been reduced and this is the reason why battery driven cars can enter the market with such force now. For ten years ago, the technology was too expensive (Respondent B).

The lack of economies of scale thus seems to be the only cost barrier that the empirical findings suggest. However, as this was only stated by one company, it is hard to say if this can apply to large companies in general. Nevertheless, the theory strengthens this statement. Del Río et al. (2010) state that eco-innovation, which can be considered an emerging technology, has a lack of economies of scale. An eco-innovation technology may be too expensive to adopt for companies and this can be explained by the fact that companies do not adopt it. They thus explain it as a downward spiral (Del Río et al., 2010) and this explanation resembles the explanation of Respondent B. One can thus see that there is a lack of economies of scale according to both theory as well as empirical findings, but whether or not this constitute a barrier for the large companies is difficult to tell, since it was only mentioned as a problem by one of the companies.

**Financing**

Barriers in connection with the barrier factor Financing were not raised as a major challenge among the companies in the study. The only barrier stated was that it can be hard to measure how much one can earn from investing in environmental sustainability. However, the majority of the respondents in the large companies did not experience any major problems when it comes to the financing of eco-innovative products or processes (Respondent A; B; D; E; F1; F3; G & H). This is also confirmed by the theory, which states that the difficulties with the financing differ depending on company size. Large companies are more likely to invest in eco-innovation due to their financial situation, whereas the financial resources among smaller companies tend to be scarce (Cecere et al., 2018). A lack of financial resources (Pinget et al., 2015) or a low profit margin pushes eco-innovation down on the agenda (Pacheco et al., 2018) and makes investments in eco-innovation very hard carry through. This due to that costs for, for instance, adapting eco-innovative benefits to the company are often too high (Pinget et al., 2015).

Company F states that financing in general can be difficult, no matter if it is for an eco-innovative product or not (Respondent F2). When making an investment decision, every aspect is thoroughly considered, not only the environmental aspects. Sometimes an investment that regards non-
environmental considerations is more of an obstacle in the investment process, than deciding whether to invest in making a product less environmentally hazardous. Barriers with financing are thus not something that particularly applies to the eco-innovative products, they apply to all products (Respondent F2). Based on these findings on the internal financing, the trend seems to be that the internal financing directed to eco-innovation is not a barrier for the large companies. There was nothing that the companies stated that excelled as a clear barrier when they talked about the internal financing.

Nevertheless, Company E stated that it can be hard to measure how much one can earn from investing in environmental sustainability, opposed to other business aspects where profitability is more easily measured.

“It is really difficult to measure how much money one can earn by working with sustainability. If one talks about other aspects, it is usually easier to establish a price tag on those”

- Respondent E

This is somewhat confirmed by the theory, which suggests that financial institutions, when granting loans, tend to have a short-term mindset that does not benefit companies that apply for loans for eco-innovative activities, as these are characterized by having long payback periods (Ghisetti et al., 2015). It thus seems like credit institutions, in similarity to Company E, experience this difficulty in measuring how profitable environmental investments are, which seems to make them doubt when granting loans.

According to the theory, it exists a difficulty for companies to be funded (Halila & Rundqvist, 2011) and in finding credit opportunities. This discouragement of eco-innovative companies when it comes to funding and granting of credits can be explained by the fact that eco-innovative technologies still are in a recent phase and that there are uncertainties on how well they will perform (Ghisetti et al., 2015). Moreover, Carrillo-Hermosilla et al. (2009) state that investment decisions usually are based on investments made earlier as well as on the issue that needs funding. The fact that eco-innovation is in an initial phase could explain why Company E experiences difficulties in the measuring of how much they can earn from investing in eco-innovation. However, Respondent E also states that rather than making sure that investments are profitable in
monetary terms, they want to build up a positive company brand and become an attractive employer for young people that tend to be focused on sustainability.

“Sustainability is a lot about building the brand and becoming an attractive employer for young people who have a greater focus on sustainability than older generations”
- Respondent E

This suggests that, at least Company E, has a long-term focus in which the achievements they make in the long-run are more important than short-term profit. This is perhaps true for more companies than Company E, based on that large companies probably are better off financially and can therefore afford more long-term investments. However, in general, one can conclude that the large companies do not seem to experience any major financial barriers when adopting the eco-innovation concept.

Main barrier related to Products and Production
Now all the barrier factors that relate to the products and production process have been presented. The conclusion is that the factor Quality requirements for the products and production process is the barrier factor in which the greatest number of companies shared a barrier, which makes this barrier factor the main factor of those relating to the products and production. The particular barrier within that factor concerned the great transitions that companies need to carry through in order to be fully eco-innovative. Based on this, that barrier moves down to the main barrier block illustrated in Figure 4.
4.1.3 Barrier factors related to the diffusion and adoption of eco-innovation

In similarity to the previous sections in the analysis and results chapter, this section will begin with the barrier factor in which the highest number of companies shared a barrier. Subsequently the other barrier factors will follow. In this section, Regulations showed to be the barrier factor in which the highest number of companies shared a barrier. More specifically, a barrier regarding the *scalability* of the company products turned out to be the main barrier. Lastly, the barrier factor Market structure and competition will be presented.

**Regulations**

In the theory, Hill (2001) stated that operating managers tend to focus on processes inside the company boundaries and do not see the full picture of the implication of newly established regulations. From the empirical findings, one can see that there is rather a focus on being proactive in relation to the regulations than not seeing the full pictures of the regulations’ implications.
The barriers that will be presented connected to the Regulation factor is first of all the barrier *scalability*, which was seen as the main barrier concerning the Regulation factor. Secondly, the barrier *time-consuming adoption* will be presented. The environmental regulations on different markets showed to be a major struggle for the large companies interviewed. There are different regulations in different countries that the large multinational companies have to adjust to if they are to sell on all markets where they are established. This causes a barrier that concerns the *scalability* of their products, stated by five out of nine companies. It is hard for the companies to sell the same version of a product to all their different markets when there are so many differences in the regulations in between countries and markets.

As an example of that the regulations differ in different countries, Respondent E states that:

“In the area of product compliance, the legislation and regulations differ enormously depending on which market one looks at. As a company that sells on a global market, we have to adjust to all of these legislative differences”

This problem that the regulation differs in different countries is also upheld by Company B, G and F. Moreover, Company G adds that:

“As a company that works globally, it is a challenge for us to live up to all regulations that exist on different local markets […] A general challenge with this is the scale of everything. A multinational company that is established on many markets is hit harder by differing regulations. If we are to carry through with solutions, it is a challenge to scale up the solutions for them to fit all markets”

- Respondent G

Respondent G thus states that these differences in regulations make it hard for multinational companies to scale up their products and sell to all the markets that they are established on. Furthermore, Respondent H and E think that there are going to be more regulations in the future. Respondent E even thinks that it is going to be even harder to respond to the regulations in the future for a company that sells globally. S/he states that it will be difficult to have the internal strength to handle that there are 350 different countries to adjust the products to. The scalability problem thus constitutes a national barrier.
Nevertheless, one can assume that the scalability is a problem for all multinational companies that are trying to sell their product to all their different markets, no matter if they want to be eco-innovative or just compliant. However, the scalability seems to be a major barrier for the eco-innovation concept as well. In order to grasp this, one has to consider the meaning of being eco-innovative again. The definition in this thesis is that eco-innovation adds value to both the financial results and the environment (James, 1997). This means that, in order to be eco-innovative, it is simply not enough to be compliant to the regulations as all companies need to be. The definition suggests that a company has to obtain advantages of their environmental strategy that benefits their financial results. When they achieve that, they are eco-innovative. As the large companies interviewed want to be in the lead on their markets and also succeed to be in the lead regarding their environmental strategy (Respondent H & Atlas Copco, 2018), it must take a lot of resources for them to not only be compliant to all the different sets of regulations, but also become market leaders with their eco-innovative abilities. This is especially true when the regulations differ depending on the market and when they increase in number as time goes. To maintain a leading position on the markets while keeping up with the regulations must thus be really demanding on the company resources. Hence, all companies need to be compliant with the regulations, but all companies cannot be eco-innovative on top of the regulations. This requires a lot of effort. This resembles what is stated in theory, that the environmental regulations make it difficult for companies to continue to introduce innovative solution. It requires that the companies constantly update themselves on the legal requirements, which makes long term plans very hard to establish (Jasiński & Tužnik, 2013).

Other than the scalability barrier, the companies have a problem that regards the time-consuming adoption that environmental regulations require. Hence, to adapt products or processes to new regulations takes a lot of time (Respondent B; E & F2). Regarding adapting the products to the regulations, Respondent E states that:

“It is about the product itself, but it is also very much about the production and emissions. We need to measure everything we do; how much waste that are left from the production, how much water we use and how much energy we use. Hence, there are a lot of things we have to adapt to. Regarding the products, it is mostly about restrictions of substances. Then you have to try something new (product concept) during a very long time and usually, there is not a lot of time given. The time given is usually about 2 years”
The replacement product that the companies find also needs to maintain the same level of performance as the old version (Respondent E & F2). If the new product does not have the same durability in terms of safety as the previous product, it can be devastating for both the company and the customers (Respondent E). There is thus a barrier that concerns the time-consuming process that new regulations entail. This barrier could thereby be a tough challenge even for the most well-appointed companies. Since no respondents considered that they had any financial problems, one can assume that just because companies are strong from a resource perspective does not mean that changes can be implemented easily and fast.

The barriers mentioned above regarding the barrier factor Regulations differ from the theory. The theory highlighted problems to even respond to new regulations, mainly because of a lack of resources and competence (OECD, 2010; Pacheco et al, 2018). The barriers in the empirical findings however, do not seem to depend on a lack of resources and competence to the same extent. For instance, the large companies seem to have sufficient resources to manage the regulations although they require a lot of time spent on them.

In sum, regarding the barrier factor Regulations, the problem with scalability constituted as the greatest barrier. Even though the companies do not have problems to respond to all the different regulations in terms of being compliant, there is still a barrier to eco-innovation which entails more than just being compliant to the different regulations. It also entails innovativeness and financial growth. Eco-innovative products that bring financial growth is thus hard to come up with and scale up when the different markets’ regulations are not harmonized.

Market structure and competition
Regarding the barrier factor Market structure and competition, the theory states that the main barrier to eco-innovation is the power of large companies and the way they can take control over the market. This constitute a competition barrier that makes it hard for other companies than the large to be attractive. The theory also mentions the costs that need to be handled in order to be able to market the companies’ new products. If a company has a weak financial situation, it is challenging for them to achieve effective and successful marketing (Jasiński & Tuźniak, 2013). The cost issue related to marketing was not found in the empiricism. However, in similarity with the theory, the empirical findings that solely target large companies also suggest a challenge with competition. For instance, Respondent A talks about the competition in producing eco labeled
products and states that if the company would not be early producers of eco labeled offers, it would constitute as a cost for them. However, if they are early with these offers it is a way of gaining market shares. It is therefore important to be at the forefront. If this is not the case, the way back to the top can be long and costly (Respondent A).

The theory also highlights that companies can have a hard time keeping up with the development on the eco-innovative market as it develops rapidly (Pinget et al., 2015). In similarity to the theory, the empirical findings show that larger companies can experience a challenge and uncertainty regarding the development of the market as well (Respondent B). Respondent B states that their greatest challenge especially concerning the eco-innovative products, is the technology development as well as the digitization and how these developments in the society are going to hit their company.

The empirical findings connected to the barrier factor Market structure and competition thus suggest a barrier concerning market uncertainty and how digitization is going to affect the company. They also suggest a problem of how not being in the forefront with eco-innovative products entails costs for the company when trying to get back to the forefront. However, as these barriers were only stated by one company respectively, they are not to consider major barriers to the eco-innovation concept.

**Main barrier related to Diffusion and Adoption**

The main barrier extracted from the section Barrier factors related to the diffusion and adoption is thereby the *scalability* barrier from the barrier factor Regulations. It was stated by five out of nine companies which makes it the barrier that the highest number of companies had in common in the section of Diffusion and Adoption. Therefore, this barrier moves down to the main barriers as illustrated in Figure 5.
Figure 5: Extraction three of the analytical framework
5. Conclusion

The research question for this thesis was: *What are the main barriers to eco-innovation for large manufacturing companies domiciled in Sweden?* The analytical framework addressed barriers connected to three different themes, namely the barriers related to; the company, the products and production and the diffusion and adoption of the eco-innovation concept. From these themes, the main barriers to eco-innovation were extracted.

After a study on nine different multinational companies within the manufacturing industry, we have concluded the main barriers. When interpreting the barriers in the empirical findings, the point of departure was too look at what barriers that were shared by the highest number of companies. By doing so, the main barriers were concluded. The analysis shows that three different barriers represent the main barriers in this study. It was one barrier from each theme. As one can see in Figure 6, the barriers were related to the barrier factors Awareness, Quality requirements for the products and production process as well as to Regulations.

To begin with, the main barrier in the Company theme, regards the *awareness of the benefits of eco-innovation*. The manufacturing companies in the study do not want to make environmental actions if there is no clear connection to benefits. Also, the choice of actions becomes a tradeoff between either considering the environment or the quality and delivery precision. As eco-innovation in this thesis entails a positive impact on both the environment and the financial results, the companies in the study simply do not seem to know what actions that actually are going to be eco-innovative, instead of only environmentally friendly. This finding confirms with theory in several ways. On the one hand the theory states that companies can differ in their perception of how beneficial eco-innovation is. Some companies simply think that the benefits do not overcome the costs (Klewitz et al., 2012). On the other hand, theory states that eco-innovative solutions are new and that there is a lack of experience in this area of eco-innovative solutions (Carrillo-Hermosilla et al., 2009). The studied companies might thus simply lack the experience of eco-innovative solutions and as a consequence of that, they also lack an *awareness of the eco-innovation concept’s benefits*.

In the second theme that regards the Products and Production, the main barrier extracted is concerning the *transitions in processes* that the companies need to carry through in order to be fully eco-innovative. These transitions are great challenges for the companies that may have had
the processes for a very long time. It also seems like the transitions are very time-consuming. These transitions are confirmed by the theory, which states that companies may need to prepare for transitions in order to be eco-innovative. As an example, they might need to change to a new business model or reallocate capital (OECD, 2010).

Lastly, from the Diffusion and Adoption theme, the main barrier extracted is the *scalability* barrier, a barrier that makes it difficult for the large multinational companies to scale up their products and make them fit all their different markets. The scalability barrier is closely linked to the fact that the environmental regulations differ depending on the market and country.

Even though regulations actually push environmental actions forward and work as a driver (Díaz-Garcia et al., 2015; Triguero et al., 2013; Sanni, 2018), eco-innovation is not only about being compliant with the environmental regulations as all companies need to be. It is about actually being eco-innovative and take market shares due to the environmental innovativeness and this is really difficult when the regulations differ so much. It is thus hard to be eco-innovative on top of the regulations, and at the same time achieve scalability in the production process. This is confirmed by the theory which also states a problem to introduce new innovative solutions when there are so many environmental regulations. The theory also adds a problem to implement long term plans when there are additional regulations to adjust to all the time (Jasiński & Tużnik, 2013).

The conclusion is thus that there are three main barriers, one from each of the three themes. They concern the awareness of eco-innovation’s benefits, the great transitions of processes and a scalability barrier caused by the environmental regulations.
5.1. Limitations

There are limitations to this study that need to be considered. First of all, considering the interpretation of empirical data, there were several options concerning the approach. We chose to look at what barriers that were shared by the highest amount of companies. However, if another approach had been chosen, the conclusion might have been different.

Secondly, as there was limited research on the barriers for large companies, a lot of the studies in the theory section are focused on the Small- and Medium Sized Enterprises, SMEs. This is a limitation in terms of the support for the empirical findings. As the theory mostly was focusing on the SMEs, the barriers for them were more and sometimes of a greater magnitude than for the large companies looked at in this thesis. However, by studying the barriers for the large companies, this thesis contributes to fill an academic gap in the literature.
Moreover, there were questions regarding barriers in the interview guide that did not contribute to the study as the large companies interviewed did not experience barriers in those areas. Therefore, the answers to the questions regarding inconsistencies within the company and network are not included in this study as they did not contribute to the answer of the research question.

5.2. Contribution

This study has several contributions. From a theoretical perspective, the study adds additional knowledge to an existing research gap. The research performed contributed with further knowledge to the field of eco-innovation by depicting barriers to eco-innovation in the manufacturing industry. By using the analytical framework, barriers were identified from the themes: Company, Products & Production and Diffusion & Adoption. Since few prior studies have highlighted this area, this study can also act as a basis for future research in this field.

The study has also contributed from a practical perspective. The study can help practitioners grasp what it takes, as a large multinational company, to become eco-innovative. The study contributes with information on transitions that need to be done and what resources eco-innovation requires in terms of both knowledge, capital and time. With the help of this study, the practitioners can also receive an idea of what other barriers they may encounter.

5.3. Suggestions for further research

As the field of eco-innovation is relatively new, there are many interesting options for future research. This study shows that there are many barriers connected to eco-innovation. Since we investigated a great number of barriers, we have not been able to study the barriers in depth. A suggestion for future studies would be to choose the three main barriers identified in this thesis and investigate them on a more detailed level. It would also be interesting to investigate how these barriers could be tackled.
6. References


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https://doi.org/10.1080/14479338.2015.1011060


7. Appendix

7.1. Deduction of interview questions

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*Table 3: Operationalization*
7.2. Interview questions in Swedish

1. Hur definierar ni hållbar innovation (eco-innovation) i företaget?
2. Hur arbetar ni med eco-innovation i ert företag idag?
3. Hur kommer ni arbeta med eco-innovation i framtiden?
4. Vad ser ni för utmaningar kopplade till följande områden:
   a. Ledningens och de anställdas medvetenhet kring eco-innovation? Då menar vi deras medvetenhet kring eco-innovations påverkan på miljön, påverkan för företagets finansiella resultat och medvetenheten kring vilket avtryck ni i nuläget har på miljön.
   b. Den kunskap och kompetens som krävs inom företaget för att eco-innovation ska vara möjligt att genomföra?
      i. Hur går ni tillväga med att säkerställa rätt kompetens inom eco-innovation?
         Utbildar ni internt i företaget, tar ni in extern kompetens eller en kombination?
      ii. Hur lätt eller svårt har ni att rekrytera rätt kompetens?
   c. Nätverkande med andra företag eller exempelvis universitet gällande eco-innovation för delning av kunskap och idéer? Arbetar ni så idag?
   d. Skillnader i synsätt mellan olika anställda gällande betydelsen av eco-innovation i företaget? Hur ni får med alla på ”samma tåg”?
   e. Kostnaderna att vara eco-innovativ?
   f. Förändring av produktionen eller produkterna mot en mer miljövänlig inriktning?
      i. Efterfrågan på miljövänliga produkter?
   h. Den externa finansieringen från exempelvis investerare eller långivare?
      i. Regleringar i Sverige? Exempelvis om det är svårt att anpassa företaget efter regleringar.
         i. Skyndar regleringar på eco-innovation eller utgör de ett hinder?
         ii. Försöker ni vara proaktiva och ändra innan regleringar har kommit eller hur är ert förhållningssätt?
      j. Marknaden för eco-innovativa produkter? Är den komplex?
   k. Konkurrens?
5. Om några eller samtliga av de utmaningar som vi ställt frågor om ovan inte är relevanta för er, har ni då några andra utmaningar att hantera kopplade till eco-innovation?
a. Hur gör ni för att tackla dessa utmaningar?

6. Finns det faktorer som underlättar ert arbete inom eco-innovation? Såsom t ex:
   a. Politisk support på global, nationell eller regional nivå? På vilket sätt?
   b. Tillgång på externt kapital? Exempel: från investerare eller långivare
   c. Öppen innovation (delning av ex. idéer och tillgångar med eventuella
      samarbetspartners)?
   d. Övrigt? Specificera
7.3. Interview questions translated into English

1. How do you define sustainable innovation (eco-innovation) in the company?
2. How do you work with eco-innovation in the company today?
3. How are you going to work with eco-innovation in the future?
4. What challenges do you see related to following areas:
   a. The management and the employees’ **awareness** concerning eco-innovation? We mean their awareness concerning eco-innovation’s impact on the environment, on the company’s financial results and the awareness regarding what imprint you currently leave on the environment.
   b. The **knowledge and competence** required within the company in order for eco-innovation to be possible to carry through?
      i. How do you go about in order to make sure that you have the right competence within eco-innovation? Do you educate internally in the company, make use of external competence or a combination of both?
      ii. How easy or difficult is it to recruit the right competence?
   c. **Networking** with other companies or, for instance, universities regarding the sharing of knowledge and ideas concerning eco-innovation? Or are you making use of networks today?
   d. **Inconsistencies in the perception** among the employees regarding eco-innovation’s meaning for the company? How do you make sure to get everybody “on board” on the same vision?
   e. The **costs** to be eco-innovative?
   f. **Changes in the production or the products** towards a more environmentally friendly approach?
      i. The demand for eco-friendly products?
   g. The **internal financing** of eco-innovation? By internal financing we mean the cash flow from operations.
   h. The **external financing** from, for instance, investors or credit institutions?
   i. **Regulations** in Sweden? For instance, if it’s difficult to adjust the company according to the regulations.
      i. Do regulations speed up the eco-innovation process or are they an obstacle?
      ii. Are you trying to be proactive and change before regulations have been implemented or what is your approach?
j. **The market** for the eco-innovative products? Is it complex?

k. Competition?

5. If any or all of the challenges we’ve questioned about so far aren’t relevant for your company, do you have other challenges to tackle related to eco-innovation?
   a. How do you tackle these challenges?

6. Are there factors that facilitate your work within eco-innovation? This could be factors such as:
   a. Political support? In what way?
   b. Access to external capital from, for instance, investors or credit institutions?
   c. Open innovation (sharing of e.g. ideas and assets among any business partners)?
   d. Other factors? Specify