Ecodesign strategies in Small- and Medium Sized Companies

Dylan Suijker
Ecodesign strategies in Small- and Medium Sized Companies

Dylan Suijker

Supervisor: Mattias Lindahl
Evaluator: Olof Hjelm
# Content

1. **Introduction** ............................................................................................................. 1
   1.1. Background ........................................................................................................... 1
   1.2. Research objective ............................................................................................... 2
   1.3. Research questions .............................................................................................. 2
   1.4. Limitations and delimitations .............................................................................. 2

2. **Methods** .................................................................................................................... 4
   2.1. Research Strategy ................................................................................................. 4
   2.2. Choice of research methods .................................................................................. 4
   2.3. Literature review methods ................................................................................... 5
   2.4. Qualitative Interviews .......................................................................................... 5
      2.4.1. Results of the qualitative interviews ................................................................. 6
      Table 1. Business focuses of the companies’ .............................................................. 6
   2.4.2. Coding the interviews ....................................................................................... 6

3. **Theoretical framework** ............................................................................................. 8
   3.1. Sustainable Development .................................................................................... 8
   3.2. Ecodesign ............................................................................................................. 8
      3.2.1. Keywords co-occurring with ecodesign ........................................................... 9
   3.3. The ecodesign challenge ....................................................................................... 9
   3.4. Ecodesign drivers and obstacles .......................................................................... 9
      3.4.1. Incentives, drivers and benefits of ecodesign .................................................. 9
      3.4.2. Drivers – Economic advantages ...................................................................... 10
      3.4.3. Drivers – Corporate image ............................................................................ 10
      3.4.4. Drivers – Innovation ...................................................................................... 10
      3.4.5. Drivers – Environmental regulations and policies .......................................... 11
      3.4.6. Barriers .......................................................................................................... 11
      3.4.7. Barriers – Size ............................................................................................... 11
      3.4.8. Barriers – Other priorities ............................................................................. 12
      3.4.9. Barriers to ecodesign methods ...................................................................... 12
   3.5. Wicked problems and trade-offs in Ecodesign ...................................................... 12
   3.6. Ecodesign Methods and tools .............................................................................. 13
   3.7. Low utilization of ecodesign methods and tools ................................................... 13
   3.8. The Life Cycle Assessment .................................................................................. 14
   3.9. Material Selection and checklists ......................................................................... 15
   3.10. Academic support of ecodesign ......................................................................... 15
   3.11. Trends in ecodesign ............................................................................................ 16

4. **Motivation for SME’s to apply ecodesign** .............................................................. 17
   4.1. Results 17
      4.1.1. Motivations to apply ecodesign ...................................................................... 17
      4.1.2. Motivation out of governmental legislation ..................................................... 17
   4.2. Discussion ........................................................................................................... 18
      4.2.1. Motivations to apply ecodesign ...................................................................... 18
5. How ecodesign SME’s ensure that their products are sustainable ........................................20
5.1. Results 20
5.1.1. The use of trial and error when practicing ecodesign ...........................................20
5.1.2. The use of logical thinking when practicing ecodesign ...........................................20
5.1.3. Design in the first phase of the ecodesign process ..................................................20
5.1.4. The use of scientific knowledge when practicing ecodesign ....................................21
5.1.5. The use of the life cycle assessment when practicing ecodesign ...............................21
5.1.6. The use of other methods and tools when practicing ecodesign ...............................21
5.1.7. Knowledge gained from suppliers ............................................................................21
5.1.8. Knowledge gained at events ....................................................................................22
5.2. Discussion ....................................................................................................................22
5.2.1. Following ‘common sense’ in the ecodesign process ................................................22
5.2.2. The use of scientific knowledge when practicing ecodesign ....................................22
5.2.3. The use of methods and tools by the SME’s ...........................................................22
5.2.4. Methods and tools – the LCA ..................................................................................23
5.2.5. Design in the first phase of the ecodesign process ..................................................23
5.2.6. Suppliers ....................................................................................................................23
5.2.7. Events .......................................................................................................................24
5.2.8. Leaking knowledge from academia to SME’s .............................................................24
5.2.9. Suggestions for academics that want to support ecodesign SME’s ..........................24
5.3. Conclusions ..................................................................................................................24

6. Benefits and obstacles that SME’s face when practicing ecodesign ..............................26
6.1. Results 26
6.1.1. A growing market for ecodesign products ...............................................................26
6.1.2. Benefits – corporate image .......................................................................................26
6.1.3. Benefits – innovation ..............................................................................................26
6.1.4. Obstacles – Wicked problems and trade-offs .........................................................27
6.1.5. Obstacles – Higher price of sustainability goods ....................................................27
6.1.6. Obstacles – innovation barriers ...............................................................................28
6.2. Discussion ....................................................................................................................28
6.2.1. Benefits of ecodesign - Business to Business ..........................................................28
6.2.2. Benefits of ecodesign - Employees .........................................................................29
6.2.3. Benefits of ecodesign - Innovation .........................................................................29
6.2.4. Benefits of ecodesign – Growing interest ...............................................................29
6.2.5. Obstacles to ecodesign - Price assumptions of ecodesigned products ....................29
6.2.6. Obstacles to ecodesign - Trade-offs ......................................................................30
6.3. Conclusions ..................................................................................................................30

7. How SME’s perceive their ecodesign market .................................................................31
7.1. Results 31
7.1.1. Growing market .......................................................................................................31
7.1.2. Collaboration ............................................................................................................31
7.1.3. Advice to starting companies on ecodesign..........................................................32
7.1.4. Ecodesign trends – Importance of social factors in ecodesign..............................32
7.2. Discussion ..................................................................................................................32
  7.2.1. Increasing attention for ecodesign.........................................................................32
  7.2.2. Collaborating........................................................................................................33
  7.2.3. Ecodesign trends – Product services .................................................................33
  7.2.4. Ecodesign trends – Importance of social factors ...............................................34
7.3. Conclusions ..................................................................................................................34

8. General discussion and future research ........................................................................35
  8.1.1. Motivation and benefits of ecodesign.................................................................35
  8.1.2. Trade-offs and tips for starting companies .........................................................35
  8.1.3. Academic support and trade-offs ......................................................................35
  8.1.4. Critique on sustainable growth ........................................................................35
8.2. Future research ..........................................................................................................36
  8.2.1. Dated literature on ecodesign ............................................................................36
  8.2.2. The use of ecodesign motivation for the promotion of ecodesign......................36

9. General conclusion ........................................................................................................37

10. Reference list ................................................................................................................38
Ecodesign strategies in Small- and Medium Sized Companies

DYLAN SUIJKER


Abstract:

The objective of this study is to find out how and why Small to Medium sized Enterprises (SME’s) practice ecodesign. This problem is investigated by conducting seven qualitative interviews with spokesmen from ecodesigning SME’s in The Netherlands. The motivations for the researched SME’s to practice ecodesign are that there are new business opportunities, that it improves the corporate image, that they have a desire to change production to benefit the environment, and out of (expected) governmental legislation. In this thesis it was found that the researched SME’s get their knowledge to ensure that their products are sustainable firstly from their employees. They also apply the method of trial and error, they consult scientific publications, suppliers, and on sustainability events. The Life Cycle Assessment was the only scientific method or tool that was used by the businesses of the respondents. The benefits of practicing ecodesign for the SME’s are that the demand for ecodesigned products is growing, that it improves the corporate image of the company, that it improves business to business relations, that it increases the loyalty of employees to their businesses through working on values that are important to them, and that it provides a new base for innovative ideas. Obstacles to practicing ecodesign seem to be that trade-offs have to be made and that consumers perceive that the ecodesigned products are overpriced.

Keywords: Sustainable Development, Small and Medium Sized Businesses, Ecodesign, Motivations for Ecodesign, Ecodesign Methods and Tools

*Dylan Suijker, Department of Earth Sciences, Uppsala University, Villavägen 16, SE- 752 36 Uppsala, Sweden*
Ecodesign strategies in Small- and Medium Sized Companies

DYLAN SUIJKER


Popular scientific summary:

Ecodesign in Small to Medium sized Enterprises: how and why do they do it?

Plastic soups, deforestation, global warming, and the depletion of resources are a few of the consequences of our consumption. Businesses that want to diminish the negative effects of their products practice ecodesign: incorporating environmental considerations into their design process.

This study on seven small to medium sized ecodesigning businesses in The Netherlands gives an insight in the strategies that these businesses employ when practicing ecodesign. It is found that they are motivated to start practicing ecodesign by new business opportunities, an expected improved reputation, and/or out of (expected) government legislation. But the most important motivator was found to be a desire to benefit the environment.

It is revealed that practicing ecodesign brings benefits to the businesses as well. The positive effects they experience are that the demand for ecodesigned products is growing, that it improves the corporate image of the company, that it improves relations with other businesses, that it increases the loyalty of their employees, and that it provides a new basis for innovative ideas. A negative effect of ecodesigning that was experienced by the businesses is that consumers perceive ecodesigned products as being overpriced.

The researched companies’ ensure that their products are sustainable through knowledge that already exists in the company, comes out of scientific publications or that comes from their suppliers. They also gain knowledge from other ecodesigning businesses they meet at sustainability events or that they collaborate with. The Life Cycle Assessment, a tool that gives insight into a products’ life cycle from start to finish, is widely used by the researched businesses. Other ecodesign methods and tools that are developed by academics aren’t implemented by the SME’s that were researched in this study.

Keywords: Sustainable Development, Small and Medium Sized Businesses, Ecodesign, Motivations for Ecodesign, Ecodesign Methods and Tools

Dylan Suijker, Department of Earth Sciences, Uppsala University, Villavägen 16, SE-752 36 Uppsala, Sweden
1. Introduction

1.1. Background

The overall wealth of people has risen to considerable amounts in the past decades. This, however, has come with a price: the effects on the environment are starting to show. Plastic soups, deforestation, mass extinction of species, and global warming are among the environmental problems that can all trace at least some of their origins to irresponsible production. And that’s not all. Production can affect air and water quality, energy consumption, and create solid and toxic waste (Hall, 2011).

Furthermore, resources are being depleted at a rapidly increasing rate, which can effectively be shown by ‘Earth Overshoot Day’. It is the day that, starting from the first of January, all natural resources are used that would take 365 days to regenerate (“Earth Overshoot Day, 2017). From that day on people are living in ‘overshoot’. This day has been appearing earlier on the calendar every year: in 1997 overshoot was reached in late September and twenty years later, in 2017, the world reached overshoot day on the 2nd of August. But there is hope. If humanity manages to turn back Earth Overshoot Day by four and a half days every year, we would return to using the natural resources of one Earth a year by the year 2050.

The framework which is to guide humanity into decreasing the negative consequences of consumption has been set. In 2015 the United Nations accepted a total of 17 goals that are meant to lead humanity to creating a better planet for people and the environment: the Sustainable Development Goals (SDGs) (Le Blanc, 2015). They are reference goals for the international development community and are meant for the period of 2015-2030. This research will centre on the second part of goal number 12: ‘Ensure sustainable consumption and production’.

SDG goal 12 is for a large part dependent on the way businesses operate (United Nations, 2018). A way businesses can contribute to the state of the environment is by designing their products with the ecology in mind, by practicing ‘ecodesign’. Bakker (1995) describes ecodesign as ‘The development of products by applying environmental criteria aimed at the reduction of the environmental impacts along the stages of the product life cycle’.

The ISO standard 14062 gives guidelines to companies that want to apply ecodesign (Lewandowska and Kurczewski, 2010). This ISO standard leads the designer through six stages: planning, conceptual design, detailed design, tests/prototype, production/launching on the market, and product revision. Incorporating the guidelines should lead to the gathering of consistent, clear, and understandable results. Lewandowska & Kurczewski write that the ISO standard recognizes that ecodesign has a multilevel and multicriterial nature, and therefore it emphasizes that the result is often a compromise between opposing and contradicting needs.

Academia can be of a great support to businesses that want to work with ecodesign. For instance, higher education can produce tools and support small companies in their ecodesign practices (Hjelm and Lindahl, 2016). As will be discussed in the theoretical framework, the academic field of ecodesign is overflowing with these different ecodesign models, frameworks and guidelines. Even though there are already a lot of research papers on methods that can potentially support companies to design their products in a sustainable fashion, there is not a lot of data on the implementation of these methods (Pigosso et al., 2016; Poulikidou et al., 2014; Prendeville et al., 2017; Rossi et al., 2016). It is suggested in the literature that the methods and tool utilization is rather low. That’s why it is interesting to see on what knowledge Small to Medium sized Enterprises (SME’s) are basing their ecodesign strategies.

Out of my personal interest in the Dutch ecodesign market it was decided to make the case of this thesis ‘ecodesigning SME’s of the Netherlands’. SME’s are chosen because I find their diverse approaches towards the concept of ecodesign especially interesting. Since they have wide varying business focuses it will be interesting to see what business practices unite them.
1.2. Research objective

The objective of this thesis is to map how and why Small and Medium sized Enterprises (SME’s) practice ecodesign. In this research a company will be considered a SME when they have less than 250 employees. They are considered to be ecodesign when their produced goods are being designed with environmental considerations. The case of this thesis is Small and Medium sized Enterprises in The Netherlands.

Firstly, the motivations for ecodesign will be investigated: this study will give an insight in what the drivers are for companies’ to practice ecodesign. Then this research will have a special focus on how these companies accumulate knowledge on designing sustainable products and what the role of scientific knowledge plays in that process. Thirdly the benefits and obstacles for businesses in practicing ecodesign will be researched. Finally, the views of interviewed spokesmen from ecodesign SME’s on the state of ecodesign in their markets will be studied.

1.3. Research questions

The objective will be met through the exploration of the following four research questions (RQs):

**RQ1: What is the motivation for SME’s to apply ecodesign?**

The first research question is meant to figure out the motivation of the SME’s for incorporating environmental considerations into their design and development process. This question will be the framework to show why businesses are choosing the path of ecodesign. The effects of governmental environment legislation on the SME’s motivation to practice ecodesign will be investigated as well.

**RQ2: How do SME’s that practice ecodesign ensure that their products are having a positive effect on the environment?**

The origin of knowledge on environmental considerations within ecodesign companies’ stands central in the second research question. This question will allow the thesis to present how the businesses are ensuring that their ecodesign approach is actually positive for the environment.

**RQ3: What are the benefits and obstacles SME’s experience when practicing ecodesign?**

This research question is about the positive and negative aspects of ecodesign for businesses, the advantages and the blocks on the road that come with it. The knowledge that can be gained out of this is that it gives insight in what can be earned by the businesses if they decide to practice ecodesign, but also what hurdles they have to overcome.

**RQ4: How do SME’s perceive the ecodesign market they inhabit?**

The fourth research question is about the perception Dutch SME’s have of environmental considerations in their market. This will give knowledge on the state of ecodesign in different business sectors and how customers think of ecodesign.

1.4. Limitations and delimitations

Since I am the only person interpreting literature and the results, there can be a bias towards what I think is the most relevant or to what I conclude out of the data. At the start of the writing of this thesis, I only had a little knowledge on the academic aspects of the ecodesign concept. This knowledge matured during
the process of writing this thesis, although there is still important literature that I haven’t been able to read during these six months.

In this study I will not look at large companies’ (bigger than 250 employees). It is my belief that large companies’ have different means to achieve their ecodesign ends than SME’s have. The research sample would be too big if they were to be included and therefore I have chosen to keep my focus on SME’s.

1.5. Outline

This thesis follows a slightly unconventional outline. Since four research questions are maintained, an appropriate structure is chosen that comes into action after the theoretical framework. For every separate research question the results will be presented first, then the discussion, and then the conclusion. In chapter 8 a concluding conclusion will be given where all the research questions come together.
2. Methods

This chapter presents the methods that are used during this study. It lays out the research strategy and the methods for the qualitative interview.

2.1. Research Strategy

As has been set out in chapter 1, the objective of this research is to figure out how and why SME’s are engaging with ecodesign. In order to do so, this study will focus on Dutch SME’s. The rationale for choosing this specific case is first that this will allow for a more specified research group. Secondly, the business sectors are different between different countries due to different legislation, different ecodesign networks and events, and many other factors that lead to a distinct business culture.

Boks et al. (2008) write that in the research of sustainable product innovation a common distinction is made between descriptive and prescriptive research. Descriptive research normally ‘takes a level of either explanatory research, thick descriptions of societal phenomena, with or without the ambition of theory extension, which can in turn be through for example modelling or hypothesis testing’ (Boks et al., 2008). Prescriptive research, on the other hand, is ‘considerably more popular and can take many forms. Distinctions can be made in audience (companies of different size, consumers, and policy makers), types of outcome (management tools, policies, creativity tools, evaluation tools, etc.) and ambition level (ranging from incremental improvement, product innovation, function innovation, to system innovation)’ (ibid.).

As has been stated, Dutch SME’s will be researched in this study. They have been selected through a search on ecodesigning companies’ in the online search engine Google. Plenty of businesses have been contacted, but not all had the resources to participate in the study. In the end seven companies’ that fitted the profile were found willing to be interviewed.

This research will be mostly descriptive. It will aim to find information on how and why ecodesign companies are conducting their practices. Therefore, it is my hope that this project will shine light on how ecodesign businesses operate and gather information to base their strategies on. However, after this information has been gathered and discussed, a somewhat prescriptive tone is presented in the discussion chapter as well. Instead of focusing on recommendations for the ecodesign companies’ or creating methods, frameworks, or tools as is quite common in the ecodesign literature, the results of this study have inspired some recommendations that are aimed towards academics that want to support ecodesign businesses.

Recommendations will be made on how academics can better get their knowledge to SME’s. For the academics that occupy themselves with ecodesign, the results can be useful because they show what motivates ecodesign businesses and where they get their knowledge from. This could inspire new ways for them to present their research on ecodesign to businesses that are interested in ecodesign.

The case of this study is Small to Medium sized Enterprises (SME’s) in The Netherlands. SME’s account for an important part of the Dutch Economy. According to data from the European Commission, a total of 1.053.548 SME’s existed in 2015, employing 3.523.900 employees (European Commission, 2016). The share of these Dutch SME’s that produced green products was 27% (European Commission, 2016). Since the amount of SME’s in The Netherlands is large and the amount of those companies’ that practice ecodesign is 27%, there is a lot of benefit that can still be gained for the environment in this population. Therefore this case is chosen.

2.2. Choice of research methods

The first step of the researching process was to research literature for the theoretical framework. This literature helped to make sense of the ecodesign concept. After the concept was better understood and the research gaps that this study wanted to fill were decided, the research questions were created. These
research questions then provided the inspiration for the questions that would be asked in the qualitative interviews of this research. Due to the exploring form of research employed in this study, the research can be seen as exploratory.

The ‘why’ part of the research objective can be traced back to research question 1, which looks into the motivations of ecodesign companies’. This will be done through exploration of the literature combined with qualitative interviews. In the theoretical framework it is investigated what the academic field of ecodesign has observed as being the motivations for companies to practice ecodesign. In the empirical study Dutch SME’s will be interviewed and asked what their drivers are for engaging in ecodesign. This research question also encompasses to what extent the Dutch ecodesign SME’s value social factors and whether their perception of governmental regulations is regarded as motivational.

The ‘how’ part will for the largest part be studied in research question 2. With help of a literature there will be investigated what knowledge sources are potentially available for ecodesign companies. Then, through interviews in the empirical study there will be investigated what sources Dutch SME’s are using in practice.

Research question 3, on the benefits and obstacles of ecodesign, will be researched through an exploration of the literature, which thereafter will be compared to the experiences from the Dutch ecodesign field as told in qualitative interviews.

The fourth research question is researched solely in the qualitative interviews. The interviewees will be asked about the current state of ecodesign in their business sector. The interviewees will also be asked what tips they would give to businesses that are just starting out with ecodesign. Trends in ecodesign will also be investigated.

2.3. Literature review methods

For the literature in the theoretical framework the databases Google Scholar and the Uppsala University online library were used. As mentioned in the previous subchapter, the literature provided a base of knowledge to build the rest of the research on. Therefore articles were consulted on the subjects of the research questions.

2.4. Qualitative Interviews

The empirical research will consist of qualitative interviews of a semi-structured nature. This means that the researcher ‘has a list of questions or fairly specific topics to be covered, often referred to as an interview guide, but the interviewee has a great deal of leeway in how to reply’ (Bryman, 2012:471). The researcher is free to adjust the questions and the question order during the interview if he senses it benefits the interview.

It is stated by Kvale and Brinkman (Kvale and Brinkmann, 2009) that the quality of a qualitative interview is highly dependent on the skills and knowledge of the interviewer. It is often not that different from a normal conversation. Kvale and Brinkmann say that this obstructs the ability to make a perfect methodology for qualitative interviews, since they are reliant on non-structured questions and understanding of the subject. Nonetheless, it is proposed that the interviewer makes a list of questions that are then to be asked in a semi-structured nature.

A list of questions was composed for this study, which is included in appendix A. The questions have been asked in the Dutch language but they have been translated for the appendix of this thesis. They are inspired by the literature in the theoretical framework and are developed with consideration of the research questions. In accordance with the suggestions of Kvale and Brinkmann (2009), they are composed in a way that simulates everyday conversation.

The respondents are representatives of small and medium sized Dutch companies that are knowledgeable on their companies’ design processes. They have been found through research on the internet and have been contacted through sending out e-mails. Seven representatives of companies that engage in ecodesign have been interviewed. Six of the interviews took place over the telephone and one
was conducted on the location where a prototype product of the company (a sustainable home) was located. All respondents were asked if they are comfortable with the interviews being recorded, which they were. Estimated time for an interview was 30 minutes.

2.4.1. Results of the qualitative interviews

For the empirical study seven interviews are conducted with representatives of Dutch ecodesign SME’s. The interviewed representatives of the companies’ are numbered in table 1 ‘business focuses of the companies’. In following chapters they will be referred to by those numbers. Interviewees are kept anonymous, but the business focuses of their companies, date of the interview, and length of the interview are found below in table 1.

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Business focus</th>
<th>Date of interview</th>
<th>Length of interview (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Recycled plastic manufacturer</td>
<td>01-03-2018</td>
<td>31:32</td>
</tr>
<tr>
<td>2</td>
<td>Soap manufacturer</td>
<td>06-03-2018</td>
<td>33:50</td>
</tr>
<tr>
<td>3</td>
<td>Sustainable design studio</td>
<td>13-03-2018</td>
<td>19:04</td>
</tr>
<tr>
<td>4</td>
<td>Road building company</td>
<td>14-03-2018</td>
<td>26:04</td>
</tr>
<tr>
<td>5</td>
<td>Jeans product service</td>
<td>19-03-2018</td>
<td>51:26</td>
</tr>
<tr>
<td>6</td>
<td>Packaging and coffee cup manufacturer/product service</td>
<td>19-03-2018</td>
<td>24:59</td>
</tr>
<tr>
<td>7</td>
<td>Sustainable home builder</td>
<td>22-03-2018</td>
<td>25:56</td>
</tr>
</tbody>
</table>

Table 1. Business focuses of the companies’.

2.4.2. Coding the interviews

After collecting the interviews, the transcripts were labelled according to their theoretical significance using the method of coding (Bryman, 2012:568). The first step was to read the interviews again and get a sense of the whole. Then the transcripts were coded.

The ‘codes … serve as shorthand devices to label, separate, compile, and organize data’ (Charmaz, 1983:186; in Bryman, 2012:568). More specifically, the method of coding that is used is called ‘selective coding’, which is ‘the procedure of selecting the core category systematically relating it to other categories, validating those relationships, and filling in categories that need further refinement and development’ (Strauss and Corbin, 1990:116; in Bryman, 2012:569). Fig. 1 shows a sample of how the transcripts are colour-coded so that the quotes in the text fit in the categories motivation, knowledge origin, government, market and other.
After being coded in those different categories, recurring concepts were determined. Summaries of quotes out of the interviews were categorized under these concepts. For instance, ‘does the company use scientific knowledge’ was a concept in the category knowledge origin. In Fig. 2 can be seen how the different answers were organized under this concept. These categorized concepts functioned as the starting point to write the results.

---

**Fig. 1.** A sample of the colour-coded transcripts.

---

**Fig. 2.** A sample of the answers categorized by concept.

---

**Does the company use scientific knowledge**

- 1. They do, if they need information they research scientific papers. Recycling of polymers is a technique tho, and they made it their own.
- 2. Doesn’t, ‘it is not rocket science’.
- 3. They do, often. Don’t want to invent the wheel for a second time.
- 4. They do, work with WNF and they work with scientists that work in environmental fields.
- 5. Not really, because it is ‘rather self-evident’, but they get a lot of knowledge from events were scientific knowledge is often discussed.
- 7. They do, ‘we definitely research materials before we use’, ‘think it habitual that after you study so long you find out which one is better’.
3. Theoretical framework

The relevance of this chapter is to gain an insight in the field of ecodesign and to explore what has already been said about the research questions. This chapter will start rather broadly, by positioning ecodesign in the discourse of sustainable development and then by explaining the concept of ecodesign itself. Then the literature regarding the themes of the research questions will be investigated.

3.1. Sustainable Development

Turning the negative environmental consequences of consumption back is one of the goals that the discourse of Sustainable Development strives towards. The discourse came into life after the publication of the UN report ‘Our Common Future’, also known as the Brundtland report. The now classic definition that the commission agreed upon for the concept of Sustainable Development is the following: ‘development which meets the needs of current generations without compromising the ability of future generations to meet their own’ (Brundtland et al., 1987). In the literature, Sustainable Development is widely regarded as one of the most dominant ecological discourses (Dryzek, 2013). The discourse, however, is critiqued for giving the impression that sustainable economic growth is possible (Dryzek, 2013). On a planet with limited resources, growth seems to be an ultimately impossible thing. The Brundtland report acknowledged these limits, but states that ‘accumulation of knowledge and the development of technology can enhance the carrying capacity of the resource base’ (Brundtland et al., 1987, in Dryzek, 2013:156). The in the Brundtland report proposed ‘accumulation of knowledge’ and ‘development of technology’ for increasing the carrying capacity of the resource base are done in the field of product design as well. This special type of environmental product development is called ‘ecodesign’.

3.2. Ecodesign

The term ecodesign in the literature is synonymous or named alongside terms like ‘Design for the Environment (DfE)’, ‘sustainable product development’, ‘sustainable product design’, ‘green innovation’ or ‘life cycle design’ (Albort-Morant et al., 2017; Chandrakumar et al., 2017; Luiz et al., 2016; Pigosso et al., 2016). The terms ‘eco’, ‘sustainable’, ‘environmental’, and ‘green’ are also often interchanged (Albort-Morant et al., 2017). All of these mentioned concepts refer at least somewhat to environmental conscious design and incorporate goals regarding ecology and economy.

Ecodesign can be regarded as a field that concerns itself with the development of environmental beneficial technology and creating products that help with the enhancing of the planets carrying capacity that is suggested in the background mentioned Brundtland report. To confront environmental challenges researchers have come up with frameworks that help guide producers and designers to incorporate environmental considerations (Chandrakumar et al., 2017). They do this under the banner of ‘ecodesign’. It is an overarching concept that constitutes of different design focused methodologies and tools for designing with the environment in mind. It has been defined in the ISO standard 14006 as “a process, integrated within design and development that aims to reduce environmental impacts and continually improve the environmental performance of products, throughout their life cycle” (ISO 14006,2011; in (Poulkidou et al., 2014, p. 35). This study will comply with that definition.

Luttropp & Lagerstedt (2006) write that design is creative. They state that creativeness is an interplay of knowledge, fantasy and imagination. Therefore, it cannot be done in a completely scientific way. Eugene Fergusson agrees, saying that design techniques are at least partly consisting of ‘non-scientific’ and ‘non-literary’ components that come from ‘the mind’s eye’ (Fergusson, 1994). A well designed product, however, originates from creativity but has a lot of thought put into it as well. Problem definition, generation of concepts, selection, and refinement are all aspects of design solutions and parts of a structured design process (Gagnon et al., 2010; in Deutz et al., 2013). Ecodesign is a form of design that requires the designer to put special thought into incorporating environmental considerations into this design process.
Many researchers agree that in the first part of the design process it is the easiest to make choices that can benefit the environment (Byggeth and Hochschorner, 2006; Collado-Ruiz and Ostad-Ahmad-Ghorabi, 2013; Luttropp and Lagerstedt, 2006; Poulikidou et al., 2014). This is because in the beginning of the process the knowledge on what the product is going to become is small, while there is a lot of freedom to design. Later on in the process the knowledge is more established but there is less freedom to change parts of the design. For instance, it is harder to change a material of a product that is already in production than it is to design a product around a certain material from the start. That is why it is important that the environment is taken into account early on in the product development stage (Ritzén, 2000).

Point of debate over the last couple of years has been whether to include social considerations in ecodesign (Luiz et al., 2016). Within ecodesign literature some have decided to rename the concept ‘sustainable design’ (Pigosso et al., 2016). The concept is quite similar to ecodesign, yet it also takes into consideration social dimensions. The balancing of environmental, economic and social dimensions is expected to continue to gain importance in the literature (Pigosso et al., 2016).

3.2.1. Keywords co-occurring with ecodesign

According to the bibliometric analysis by Pigosso et al., keywords that are often used in articles about ecodesign and are not substitutes for the word itself (e.g. ‘design for the environment) are ‘sustainability’, ‘product design’, ‘environmental impact’, ‘product development’, ‘industrial ecology’, ‘sustainable development’, ‘environmental management’, ‘recycling’, and ‘remanufacturing’ (Pigosso et al., 2016). Luiz et al. (2016:250) found ‘energy consumption’, ‘optimization’, ‘recycling’, ‘regulation’, and ‘business’ (Luiz et al., 2016).

Both bibliometric analyses found an immense importance of the term ‘Life Cycle Assessment’. This is an evaluation tool for environmental performance. Pigosso et al. (2016) found that it was the single most occurring term in their base of publications apart from ecodesign itself. The bibliometric analysis by Luiz et al. (2016) showed that the LCA was the term that co-occurred the most with ecodesign in the titles and abstracts of the articles.

3.3. The ecodesign challenge

Nidumolu et al. (2009) define the ecodesign challenge in the following way: ‘to develop sustainable offerings or redesign existing ones to become eco-friendly.’ For doing this, a set of competencies is required by the ecodesign practicing businesses. First, Nidumolu et al. state that within the company it is required to be skilled in knowing which product or services are most harmful to the environment. Then, companies should be able to acquire public support. The third skill that is required is that it must be known how to upscale both supplies of green materials and the manufacturing of the products.

3.4. Ecodesign drivers and obstacles

To understand the motivations for a company to practice ecodesign, their drivers and barriers should be understood. Throughout the years the barriers and incentives for businesses to undertake in ecodesign have been an interest in the ecodesign literature (Luiz et al., 2016; Poulikidou et al., 2014). This subchapter presents a summary of what was found over the years.

3.4.1. Incentives, drivers and benefits of ecodesign

Van Hemel and Cramer (2002) in a study of 77 Dutch SME’s found that internal stimuli are stronger driving forces for Dutch SMEs to engage into ecodesign activities than external stimuli are. In the literature the most influential of these internal stimuli were found to be the opportunities for innovation,
the expected increase of product quality, the potential market opportunities, competitive advantages, improved corporate image, profits, and cost reduction (Dangelico, 2016; Plouffe et al., 2011; Santolaria et al., 2011; Van Hemel and Cramer, 2002). Other internal drivers are linked to values, for instance the personal ideologies of managers and other feelings of ecological responsibility within the organisation. Most influential external stimuli were customer and market demands, governmental legislation (current and/or expected), and industrial sector initiatives (ibid.)

3.4.2. Drivers – Economic advantages

In the literature, ecodesign has been reported to come with economic benefits. The potential reduction of costs and an increase in revenues are named to be important economic advantages and consequently drivers for companies to adopt ecodesign methods (Borchardt et al., 2011; Plouffe et al., 2011). These reductions of costs are mostly due to increased resource efficiency (Sanyé-Mengual et al., 2014). For instance, energy savings are a common way ecodesign can lead to a reduction of costs (Plouffe et al., 2011). Cost reductions can also be accomplished by other means such as the use of recycled materials that are cheaper than non-recycled materials or a better use of raw materials (Borchardt et al., 2011; Platcheck et al., 2008).

In their empirical study Plouffe et al. (Plouffe et al., 2011) found that 17 out of 30 researched firms experienced a reduction in variable production costs compared to traditional production methods. Out of these 17 firms, 13 reported that savings were primarily made on raw materials. A reduction of the used energy was an important cost saver for 6 out of the 17 businesses. Fixed costs, on the other hand, were generally reported to be larger compared to traditional business practices (according to 26 out of 30 firms). However, this might be an investment that is easily returned since 26 out of 30 companies reported an increase in revenues connected to ecodesign.

3.4.3. Drivers – Corporate image

Costumers are increasingly more sensitive to environmental issues (Plouffe et al., 2011). This provides an opportunity for companies to improve their corporate image. They can achieve this by being more environmentally conscious. Chen (2008) has shown that green core competences of firms indeed are positively correlated to their green images.

The sector B2B (business to business) has been reported to be extra sensitive to ecodesigned products (Plouffe et al., 2011). Businesses appear to want to work with companies’ that share the same environmental values. An increasing number of public and private organisations desire their suppliers to meet environmental requirements. Being environmentally conscious qualifies a SME for being a potential supplier to these companies. This can then result in a long-term strategic partnership with a focal or buying company in the supply chain (Dangelico, 2016).

Environmental considerations can boost the motivation of the workforce through coming together more closely with the values of employees (Plouffe et al., 2011). When a company sells a service, such as a long term replacement plan that has the goal of gaining environmental benefits, it is also a way to get better customer loyalty. This is because a certain model will allow the company to stay in contact with the costumer for a longer time.

3.4.4. Drivers – Innovation

Ecological sustainability has significant implications for business related management areas such as innovation, product development, and consumption choices (Pujari 2006; Brones et al. 2014; and Barr et al. 2010; all in Luiz et al., 2016). Santolaria et al. (2011) write that environmental causes are progressively more seen by businesses as opportunities to ‘drive business efficiencies, stimulate innovation, reduce costs, improve brand positioning and enhance business communications’. They give companies a chance to add new value to their core business aspects. It is even accentuated in the literature that businesses that busy themselves with environmental causes are more innovative, creative and
entrepreneurial (Esty and Winston, 2009; Plouffe et al., 2011). It also works vice versa, environmental factors often play a fundamental role in innovation driven companies that want to add sustainable value to their business strategy (Santolaria et al., 2011).

3.4.5. Drivers – Environmental regulations and policies

Current environmental regulations and policies, as well as expected ones, form the most important external driver for companies to apply ecodesign (Dangelico, 2016). However, regulations are somewhat disputed in the literature (Kammerer, 2009). On the one hand, Rehfeld et al. (2007) conducted an econometric analysis that found a significantly positive effect of environmental policy on environmental product innovation. Measures concerning waste disposal and take-back systems of products also had positive effects. Research however, has also been showing that when ecodesign practices are restricted to uphold legal requirements, companies often don’t do more than the bare minimum (Akkermark, 1999; Boks, 2006 in Deutz et al., 2013). Object of debate in a lot of studies was what type of policy instruments would motivate firms the most to engage in environmental behaviour (e.g. emission charges, permits, standards) (Rehfeld et al., 2007).

The European Union has introduced an increasing amount of policies to address environmental issues concerning products and their life cycles (Dalhammar, 2016). According to Dalhammer (2016) they can be divided into three main categories: ‘making products more energy efficient, banning hazardous substances, and making sure the product is disposed of in an appropriate way at its end-of-life stage’. As of now, Dalhammar found that they provide limited incentives for manufacturers to busy themselves with ecodesign practise.

3.4.6. Barriers

As discussed, implementing ecodesign and environmental consciousness can bring advantages to SME’s besides environmental ones, such as cost reduction and improved customer relations. If ecodesign methods are such beneficial tools to adopt, the question of what is stopping certain SME’s from not embracing them arises. What are the barriers to implementing ecodesign?

In the literature a wide array of barriers are discussed. The main barriers for companies to practice ecodesign are: conflict with functional requirements, doubt or disbelief about the environmental benefits of environmental initiatives, commercial disadvantage, a more complex and time consuming nature of the product designs, a lack of knowledge, belief that the company does not have significant environmental impacts, and difficulties transforming environmental ideals and aspirations into reality (Collado-Ruiz and Ostad-Ahmad-Ghorabi, 2013; Perron, 2005; Van Hemel and Cramer, 2002).

Rossi et al. (Rossi et al., 2016) write that a large number of research work attempts to find the barriers between methods and tools that are proposed by researchers and companies applying them. The results of their literature review of these studies reveals that companies struggle to modify traditional design processes. They don’t want to invest time in new strategies that haven’t been proven to be lucrative yet. Other factors that they came across are ‘the lack of full awareness about the product criticalities or potentialities, the need for specific knowledge of sustainable issues and the not yet decisive customer and legislation pressure’ (Rossi et al. 2016, p. 370).

3.4.7. Barriers – Size

The size of a company can be a distincing factor in its ability to be sustainable. This is because of issues regarding the availability of employees or specialist expertise (Deutz et al., 2013; Van Hemel and Cramer, 2002). A common critique is that ecodesign tools and methods are not designed ideally for easy integration in the Small to Medium sized Enterprises’ organisations (Le Pochat et al., 2007).

The excessive demands that the evaluation of environmental performances has on resources like time, money and personnel are regularly too exorbitant for a SME (Prendeville et al., 2017). For instance, the LCA is reported to be the most effective tool for environmental assessment, but it is often too complex
and time-consuming to be easily practiced within SME’s (Le Pochat et al., 2007). Furthermore, the small size of SME’s makes them generate less environmental data that can be used (Perron, 2005). In studies it has been reported that SME’s have troubles ‘finding, obtaining, and understating environmental information relevant to their business’ (Perron, 2005).

3.4.8. Barriers – Other priorities

Having lower environmental impact is not the top priority in the industry. Costs and legal requirements are still the main focus (Borchardt et al., 2011). Rehfeld et al. (2007) found that higher prices are a major obstacle for commercial exploitation of ecodesign goods. This means that pricing will limit companies in certain scenarios and that customer demand of ecodesign products cannot always justify higher pricing.

3.4.9. Barriers to ecodesign methods

Rossi et al. (Rossi et al., 2016) researched literature on the barriers to implement ecodesign methods. They found that the barriers for companies to implement the Life Cycle Assessment are: time effort, the requirement of specific knowledge, economic resources needed, and the large number of different tools available. Databases also come with barriers because they are not always complete. For instance, data on local realities may be non-existing and therefore producers might find it hard to choose between materials (Borchardt et al., 2011).

3.5. Wicked problems and trade-offs in Ecodesign

The problems that the field of sustainability tries to confront, and that are often present in ecodesign, can be considered wicked problems (Gosselin et al., 2016). Wicked problems are ‘real life challenges involving complex systems that are characterized by legitimate, competing values, difficult to predict cause and effect relationships, high degree of uncertainty, and multilevel social interactions’ (Rittel and Webber, 1973, in Gosselin et al., 2016, p. 268). Wicked problems are too complex to be adequately understood with the perspective of one academic discipline alone. That’s why research for sustainability is often interdisciplinary. For ecodesign this is not different. Boks et al. (2008) conclude that an interdisciplinary research approach is essential for assessing products that aim to be sustainable, and as mentioned before there has been a multidisciplinary focus in the ecodesign literature in the recent years (Pigosso et al., 2016).

An example of a wicked problem related to ecodesign can be found in the European Commission brochure Ecodesign your future (European Commission, 2014). In it, the importance of avoiding ‘uncoordinated product planning’ is being discussed. This could for instance encompass the unwanted rise of energy consumption in the process of eliminating a toxic substance. If this would overall lead to a negative impact on the environment, then the endeavour was in vain. It shows that in the process of planning for ecodesign competing values exist and that the level of uncertainty is often high.

Trade-off situations like these are frequently presenting themselves in the product development phase, wherein different solutions accentuate other aspects (Byggeth and Hochschorner, 2006). Another common trade-off is the choice between a lightweight material that is fuel efficient when being transported or a durable material that weights more due to higher material usage meant for strengthening the product (Brennan et al. (2015); in (Prendeville et al., 2017). The trade-off choice between life extension strategies that prolong the lifetime against new products that are more energy efficient is a frequently observed trade of situation for electronic products (Gutowski et al. 2011; Bakker et al. 2012; both in (Prendeville et al., 2017).

Prendeville (2017) categorized the different dilemmas that appeared in the literature and his case studies as can be seen in figure 3 below.
13

Contradictions – ecodesign strategies lead to unintended increases in environmental impacts, or, paradoxical outcomes are observed in approaches to sustainable innovation

Tensions – bilateral tensions between two ecodesign strategies

Hierarchies – Synergies and preclusions between two or more ecodesign strategies where a single dominant strategy, or reinforcing synergies, precludes others

Oversights – emphasis on one ecodesign strategy disavows other potentially synergistic ones causing blind spots in ecodesign decision making

Fig. 3. Trade-off categorization figure and description, by Prendeville et al., (2017, p. 1335).

In the literature trade-offs are often treated from a positivist viewpoint, with an emphasis on quantification and a tendency to compare product characteristics (Prendeville et al., 2017). It should be noted that research has suggested that results from these technical tools could be insufficient for making trade-off decisions (Byggeth and Hochschorner, 2006). This, however, hasn’t stopped the significant emphasis of research on technical solutions. An important technical conceptual framework that can help businesses to take into account environmental perspectives is the Life Cycle Assessment, which will be discussed later on in the theoretical framework.

3.6. Ecodesign Methods and tools

There are at least 150 ecodesign tools and methods in existence (Pigosso et al., 2014, in McAloone and Pigosso, 2017). As discussed, the life cycle assessment is by far the most widely used one. This chapter shortly discusses the LCA and other ecodesign methods.

Lindahl (2005) has suggested that ecodesign methods and tool require having the following aspects:

- Be easy to adopt and implement
- Facilitate designers to fulfil specified requirements
- Reduce the risk that important elements in the product development phase are forgotten.

And what he considers to be the most important:

- That the use of the method or tool must reduce the total calendar time (from start to end) to solve the task

3.7. Low utilization of ecodesign methods and tools

Designers are largely free to choose the methods or tools that they want (Lindahl, 2005). Lindahl states that the method or tool they select can be interpreted to be connected to four topics:
“(1) to what extent the method or tool is experienced as beneficial; (2) whether the utilization of the method or tool is in one way or the other required by the customer; (3) the method or tool’s primary purpose, and (4) its level of complexity (must not be unnecessarily complicated to use).”

As this theoretical framework shows, there are many different tools and methods developed by the academic field of ecodesign where ecodesigners can choose from. They all propose ways of helping producers to develop products in an environmentally conscious manner. Although this is the case, it is generally reported that systematic adaptation of these ecodesign strategies in businesses and design processes is low (Pigosso et al., 2016; Poulikidou et al., 2014; Prendeville et al., 2017; Rossi et al., 2016). Ecodesign methods and tools are still not used systematically in the production of new products.

Already in 2001 Tukker et al. studied the maturity of ecodesign in Europe. At the time they wrote that even in ‘front runner countries’ the implementation of ecodesign was still ‘quite limited’ (Tukker et al., 2001). The front runner countries were mainly busying themselves with method development instead of implementation. Another empirical study performed in (Handfield et al., 2001) by Handfield et al. found gaps between theory and practice. It concluded that 10 ‘best of the class’ environmental businesses didn’t use ecodesign methods with any great depth.

There is a lack of a broad based study that provides a clear depiction of ecodesign in practice in the industry (Deutz et al., 2013). However, recent studies show that over the years this gap between method development and implication hasn’t been fully closed. In the United Kingdom Deutz et al. (2013) set out to research to what extent ‘design’ is structured in practice, and if designers consider environmental issues to be relevant to their products and incorporate them in their designs. They found that integrating environmental considerations into design processes is “far from a standard practice”. A similar study in Sweden found that environmental practices were increasing in importance, but that a standard holistic approach was lacking (Jönbrink et al. 2013; in Poulikidou et al., 2014).

3.8. The Life Cycle Assessment

According to the bibliometric analysis by Pigosso et al. (2016), the environmental evaluation method ‘Life Cycle Assessment (LCA)’ is the keyword that shows up the most in ecodesign related publications. The bibliometric analysis by Luiz et al. (2016) also found that it is the single term that co-occurs the most with ecodesign in publications. The LCA has found a rapidly expanding increase in academic interest, while 1992 was the first year with more than 10 publications on the topic, it rose above 1700 publications in 2013 (McManus and Taylor, 2015).

Life Cycle Assessment is a tool to map the environmental costs of a product while looking at its whole life cycle (Klöpffer and Grahl, 2014). The method is defined in the international standards ISO 14040 and 14044. ISO standard 14040 describes the framework in the following way:

“LCA studies the environmental aspects and potential impacts throughout a product’s life (i.e. cradle-to-grave) from raw material acquisition through production, use and disposal. The general categories of environmental impacts needing consideration include resource use, human health, and ecological consequences.” (ISO; in Klöpffer & Grahl, 2014, p. 1)

The Life Cycle Assessment is grounded in two practices (Kirchain, 2017). The first is to map out all the activities that have contributed to the construction, operation and disposition of a certain product. Secondly, this list of ‘life cycle activities’ is connected to impacts that are consequences of the inflows from and outflows to the natural world that are caused by these life cycle activities. By mapping and
considering all these life cycle activities, a broader understanding of the environmental consequences of a product's life cycle can be achieved. LCA's are increasingly more focused on holistic sustainability, including not only the environmental aspects but also economic and social ones (Hellweg and i Canals, 2014; McManus and Taylor, 2015). There are methods for life cycle costing, but work on the social assessments is in its beginning phase and still needs development.

The focus on the whole life cycle is what gives the Life Cycle Assessment its big scope (Finnveden et al., 2009). It gives the Life Cycle Assessments the ability to avoid shifting environmental burdens between different phases of the life cycles (Finnveden et al., 2009; Hellweg and i Canals, 2014). A comprehensive and holistic analysis will also allow the manufacturer to avoid burden shifting between different environmental concerns. To avoid burden shifting from one geographic location to another, it is important to include all relevant countries in the life cycle assessment.

For the assessment to be done successfully there is need of a great number of high quality data on the entire product life cycle (Rossi et al., 2016). A strong relationship with the suppliers in the supply chain is therefore required, because it requires data on all components purchased by the company. In the end, a LCA will 'only ever be as good as the data and assumptions it uses’ (McManus and Taylor, 2015).

In the process of conducting a LCA it is almost certain that one will have to deal with uncertainties and data gaps (Finnveden et al., 2009; Hellweg and Canals, 2014). Because of the complex nature of production, it is hard to determine the exact environmental consequences of the activities in the products life cycle. Uncertainty in the life cycle assessment can be defined as “the discrepancy between a measured or calculated quantity and the true value of that quantity” (Finnveden et al., 2009). In the ISO 14040 framework uncertainty is most prominently handled in the ‘interpretation’ phase.

Special software exists for conducting life cycle assessments. All of the tools are rather complex, and therefore require skilled professionals to use. Simplified LCA tools also exist, but they still require training to be used properly.

It is very fruitful to include the LCA at an early stage of the product and design process, since there is a lot of freedom to make changes of impact at that point (Hellweg and Canals, 2014). The LCA can be a most helpful tool for ecodesign, through giving the designer insight in all the complex environmental concerns that are associated with its product. It allows the designer to identify areas of the design that are suitable for environmental improvement and to consider different design options. However, without an actual product it can be hard to conduct a LCA (Collado-Ruiz and Ostad-Ahmad-Ghorabi, 2013). Solutions can be to select a similar product or use estimations.

### 3.9. Material Selection and checklists

Material databases and guidelines can be easy to use tools that enable companies to determine their material use (Le Pochat et al., 2007). Luttropp & Lagerstedt (2006) write that a common way to start the process of ecodesign is to create a white, grey and black list. The white list consists of materials that should be used; the grey list of materials that might be used if a good reason presents itself, and the black list is the list for forbidden materials that should be avoided.

### 3.10. Academic support of ecodesign

Two bibliometric analyses conducted on the ecodesign literature by Pigosso et al. (Pigosso et al., 2016) and Luiz et al. (Luiz et al., 2016) are seeing a strong increase in published articles on ecodesign. Pigosso et al. found that in the 5.5 years from 2010 until June 2015 a total of 64.3% of the assessed papers were written. Papers were assessed over a timeframe of 22 years in total. Luiz et al. (2016:245) found that in the period from 1992 until 2009 an average of 7.8 articles per year were being published. This went up in the period from 2010 until 2015 wherein 38.5 papers were published averagely per year. Over a third of their analysed 375 papers were published in the 3 years between 2013 and 2015. Luiz et al. (2016) state that this trend of increasing publications shows that the field of ecodesign is now matured.
With all these research, academia can play a role in knowledge transfer, capacity building, assessments and new perspectives (Hjelm and Lindahl, 2016). Gosselin et al. (2016) seem to share these views: “Higher education needs to more effectively develop collaborations within colleges and universities and with external partners to address the many environmental challenges posed by human activities”. They also add that cooperation between businesses and academia can prepare students of today to meet upcoming intellectual and workforce requirements.

3.11. Trends in ecodesign

Pigosso et al. (2016) write that it can be expected that in the next decade there will be an increase of product services. They see an increase in exploration of these product/service systems. These new product systems have to potential to be beneficial for the environment because they are dematerializing.

In the years from 2010-2013, Luiz et al. (2016) observe an expansion of the definition of ecodesign. The inclusion of social factors resulted in the ‘design for sustainability’ concept. An expected path that the ecodesign field will follow is that of including social consideration in the concept, resulting in an increased focus on ‘design for sustainability’. It is expected that ecodesign tools such as the Life Cycle Assessment will evolve to include more social considerations (Hellweg and Canals, 2014; Pigosso et al., 2016).

Pigosso et al. (2016,) report that a focus on extending beyond the own company borders into the supply chain is also reported to be a subject that is getting more traction in the research field.
4. Motivation for SME’s to apply ecodesign

This is the first chapter out of four that are trying delving into the research questions. The structure of these four chapters is as follows: first the results will be presented, then they will be discussed, and lastly the chapters will be ended with a conclusion. The companies’ are made anonymous and are numbered according to table 1 in the methods chapter. The research question that will be investigated in this chapter is research question 1: ‘What is the motivation for SME’s to apply ecodesign?’

4.1. Results

4.1.1. Motivations to apply ecodesign

Out of the interviews it became clear that there are common drivers that are shared by the different companies, but individual drivers as well. A significant number of the companies shared that they were already experienced in their respective sectors and from there noticed opportunities for change [1-2, 4-6]. Interviewee 1, who speaks on behalf of a company that produces recycled plastics, declared that a few years back they noticed that the image of the polymer sector was getting a blow. Plastics were rapidly getting a bad reputation. At that point the owner of the company, who was convinced that plastics can still be a wonderful material for production, left his current job at a big plastic production plant and founded the company that produces quality polymer from previously used plastic resources.

In a similar way interviewee 2 was working at the soap department for a large multinational consumer goods company when he decided that the industry could use a more sustainable alternative. Interviewee 4 represents a road manufacturing company, who decided internally to design more environmentally friendly roads. This was partly due to expected government legislation pressure on the asphalt product. The owner of company 5 had 30 years of experience in the Chinese textile industry, where he personally experienced the impact fast fashion has on the environment and factory workers. To combat this he started a jeans production service. Company 6, a packaging company that also produces coffee cups, felt social responsibility for their contribution to the waste problem which made them search for more sustainable solutions. All of the five companies with previous experience in their fields underlined that in some way or another ‘going sustainable’ posed a lucrative business opportunity.

The remaining two companies started producing environmentally conscious from the start, without previous experience in their field. The sustainable designers from company 3 consist of recent graduates from a university industrial design program who ‘didn’t just want to design the next coffee machine’. The sustainable house builders from company 7 are also recent graduates, most with an architectural background. They wanted to show that it is possible to build in new ways in the very stagnant construction market. Both are started by and employ relatively young people.

4.1.2. Motivation out of governmental legislation

It is interesting to note that a lot of the interviewees found that it is important to work on sustainability issues themselves, instead of waiting for the government to come with regulations. Interviewee 1 thought the industry should be able to fix problems itself, and that only if they won’t it will be time for the government to jump in and help. He sees that at the moment more regulations in the plastics industry are coming into motion, but that some are not yet ideal. For instance, right now he sees that the money that is being charged for plastic packaging is getting charged per kilo. This doesn’t make sense in his opinion, because companies will start making thinner plastics that are lighter but not recyclable. There is a discussion going on, and this will probably change.

Interviewee 6 sees that the market is changing itself already, but believes that the companies’ that are pushing the boundaries at the moment should be more rewarded for their efforts. Financial stimuli are often the factor that makes the market move, in his opinion. The sustainable design studio of interviewee 3 is also convinced that change should come out of the industry itself. Still they started investigating
different subsidies since last year. At the moment they are in a trajectory with their local government and with the European Union. He feels that multi-layered plastics are an area wherein the government could do more, because the material is very hard to recycle. In his opinion this could be done negatively through fines or positively through collection initiatives.

Interviewee 4 sees that the requirements for roads are becoming tougher and acknowledges that this is a major push for his company and other road manufacturers to come up with innovations. These regulations are for instance about the smoothness of the surface of car roads. On the other hand, he notices that there is a lack of an overarching vision within the government. He states that he is using recycled plastics for his roads, but that no road managers (who are funded by the Dutch government) are prepared to pay for that. Interviewee 4: ‘that we’re also working on a plastics problem, they like that, but it’s not that he has a budget for this. You work on different governmental goals, but they are not paid from one joint account. His solution would be a general innovation funding budget on a national level.

4.2. Discussion

4.2.1. Motivations to apply ecodesign

The internal stimuli that were found in the theoretical framework were not so much named as motivations to practice ecodesign by the interviewed company spokesmen, but rather as benefits of producing in a sustainable manner. The in the theoretical framework found drivers are opportunities for innovation, the expected increase of product quality, the potential market opportunities, competitive advantages, improved corporate image, profits, and cost reduction (Dangelico, 2016; Plouffe et al., 2011; Santolaria et al., 2011; Van Hemel and Cramer, 2002). The internal motivations for Dutch SME’s to practice ecodesign found in the qualitative interviews were new business opportunities, improved corporate image, and a desire to change production to benefit the environment.

It is interesting that all interviewees reported that the most important motivation at the start of their companies’ was that the possibility to change their respective fields into a more sustainable one was noticed. This study lays bare that it is not uncommon for people to have a look at their sector and think about how they can change it into a business sector that is less harmful for the environment. It can be reasoned that it is the case that this thinking about changing the business sectors is influenced by other motivations than a better environment as well, for instance to increase the corporate image, as can be noticed by the recycled plastic company that noticed plastics were quickly getting a bad reputation.

The mentioned other drivers that are found in the theoretical framework were also named in the qualitative interviews, but came to the front at another point in the interview when asked about ‘benefits of ecodesign’ and can therefore not be directly named as motivators. A limitation here is the placement of the question on ecodesign drivers in the interview process. It is one of the first questions that were asked and it is noticeable that most interviewees used it as a starting point to jump into an introduction of their company by giving an overview of their business history. It is imaginable that other motivators would have been named if the interviewer would have asked further questions to go more deeply into the subject. The limitation that wanting to change the business sector into a more sustainable one is a desirable answer should also be considered.

Van Hemel and Cramer (2002) state that internal stimuli are stronger driving forces for SME’s to practice ecodesign than external stimuli are. This study found that this is still the case. Six companies’ were largely motivated by the internal stimuli of opportunities for change and a want to benefit the environment. Only one company was motivated by an external stimulus, which is expected government regulation.

The limitation of this observation is that the research sample is rather small and therefore hard to generalize. Only seven SME’s were consulted, whereas for instance the original study of Van Hemel and Cramer (2002) researched 77 SME’s. Therefore, the results will be hard to quantify towards the whole sector of small and medium sized Dutch ecodesign companies. The results can be seen as an insight in the
culture and the general tendencies within these companies, rather than an overarching representation of the entire ecodesign sector in The Netherlands.

4.2.2. Motivation out of governmental legislation

In the theoretical framework Dangelico (2016) was referred to saying that current and expected environmental regulations and policies are the most important external stimuli. Governmental legislation is the only direct external motivator named by the interviewees of this research, so that statement slightly matches with the results of this study. This doesn’t take away the fact that except for the sustainable road manufacturer, who expects more legislation on the asphalt product, the other interviewees didn’t feel that government regulations were a motivation to practice ecodesign. As discussed, they rather practice ecodesign out of perceived business opportunities and a pure desire to benefit the environment. Most interviewees in this study however noticed that the government is becoming more active in supporting environmentally conscious enterprises. It is therefore not unthinkable that government regulation will become a more important motivation for businesses in The Netherlands to start working with ecodesign.

It is discussed in the literature that the effect of environmental legislations are disputed in the literature, with some researchers finding positive effects and others stating that businesses will only do the bare minimum if there are restrictions (Deutz et al., 2013; Kammerer, 2009; Rehfeld et al., 2007). All except one of the interviewees of the businesses that were researched in this study said that governmental regulation didn’t positively influence the way they conduct their ecodesign practice. Limitation of this result is that the interviewed companies’ are already practicing ecodesign for some time. They started before the increase in regulations took place and therefore are a group that naturally isn’t motivated by governmental legislation.

Some of the interviewees are even critical on the way that the government legislates at the moment. The perception that the government is largely restricting through regulations instead of awarding through subsidies lives in the heads of the interviewees. A call for more positive financial stimuli is heard, although this is not very surprising coming from companies that are already engaging in ecodesign.

4.3. Conclusions

In this chapter RQ1 was researched, ‘What is the motivation for SME’s to apply ecodesign?’ The ecodesigning SME’s of this research sample were motivated by the internal stimuli new business opportunities, improved corporate image, and a desire to change production to benefit the environment. The only external motivator that was named was governmental legislation, but only by one out of the seven interviewees. The other six were critical of governmental legislation and didn’t feel that it positively influenced their motivation.
5. How ecodesign SME’s ensure that their products are sustainable

In this chapter research question 2 stands central: ‘How do SME’s that practice ecodesign ensure that their products are having a positive effect on the environment?’ In the results of this chapter the knowledge, methods, and tools that the interviewed SME’s use for their ecodesign practice will be presented. Thereafter these results will be discussed and compared to the theoretical framework in the discussion, before the chapter ends with a conclusion.

5.1. Results

5.1.1. The use of trial and error when practicing ecodesign

A popular method to get to knowledge on sustainability was through ‘trial and error’ [used by company 2-4, 6-7]. For instance, the owner of company 2 states that he experiments with different blends for his soap, using only the materials that are most environmentally friendly. Interviewee 3 stated that a ‘head on approach’ was very important to their business structure. In many stages of the product development they try to be active and see if it works, instead of philosophising and thinking too long. Company 7 has built its sustainable home ten times now, and every time they improved on the design from an environmental perspective. At the moment they are very happy with the materials they are using, stating all have the optimal environmental attributes, accept concrete which they currently cannot build without. They also improved on the different systems of the house (such as ventilation or energy supply) throughout the different models they made in their short life as a company.

5.1.2. The use of logical thinking when practicing ecodesign

Logical thinking, brainstorming, and anticipating were widely named as methods for sustainable product development. In the words of interviewee 4: ‘it’s looking at the options, what’s in it, how recyclable is it, and what components are in it and are they sustainable. It’s a bit of logical thinking’. This suggests that the companies’ achieve sustainability in their own and independent way. Although this is certainly partly true, they all acknowledge that they are inspired by other sustainable entrepreneurs, scientific knowledge, and/or by keeping track of developments in the field. The participation in sustainability events is often named as an important source of knowledge.

5.1.3. Design in the first phase of the ecodesign process

The interviewees underlined the importance design in the first phase of the product development has on the environmental qualities of the product. In the words of interviewee 2: ‘the production of soap, and actually this goes up for every industry: in the first stage when someone starts designing a product, they can decide if they want to do this in a sustainable manner or in a conventional one’. Once the product is produced it is hard to change it in a later stage. Interviewee 7 indicated that even if they build modular homes, once the building stands it is hard to change systems such as energy supply and ventilation. That’s why every time they build the sustainable home (it has been built ten times now) they change the building to incorporate the newest improvements they developed.

Interestingly enough the jeans leasing company [5] chooses an opposite business strategy wherein they change as little as possible on their design. They have six models for men and eight for women, which all come in four different colours and a multitude of different sizes. In the end this adds up to be a lot of different versions of the jeans. Changing the model too often would give them a lot of trouble since they are a small company and it is hard for them to keep their magazines stacked. They are choosing to keep the production going with their current design to ensure that they have a stable supply of all the versions of the jeans.
5.1.4. The use of scientific knowledge when practicing ecodesign

Out of the seven companies, five consult scientific sources [1, 3-5, 7]. The reasons given for this were the need for information and not wanting to invent the wheel for a second time. Interviewee [2] declared that he didn’t need scientific knowledge because he already knows how to make soap and that ‘it is not rocket science’. He added that a lot of the scientific knowledge on soaps is connected to chemicals, which are substances he tries to avoid since he only wants to use natural ingredients. For the packaging company [6] there is no reason to turn to scientific sources because their sustainability method is ‘self-evident’: they use a waste product from sugar cones. They do attend sustainability business events where scientific knowledge is discussed.

5.1.5. The use of the life cycle assessment when practicing ecodesign

The Life Cycle Assessment is the most widely used scientific method by the companies. Five of the companies reported that they at some point made use of the assessment in some form or another [3-7]. Motivations for doing so varied a bit.

Company [6] used the LCA method to show to other parties that their coffee cup was the most sustainable option in the market. They already were aware that this was the case since they had sufficient knowledge on all other coffee cup distributors in the Dutch market, but the LCA allowed them to communicate this to their stakeholders as well. Interviewee [3] viewed the LCA in a similar way, seeing the assessment as substantiation for the company’s ecological achievements. They don’t use it for all their products, often only when their clients ask for it. Still, the interviewee acknowledged the value of the insight it gives in the lifecycle of the products of company [3] as well. For company [5] the use of the LCA was also motivated by both communication and life cycle insight purposes.

For company [4] and [7] the latter was the most important motivation for conducting the assessment. They choose to do the LCA because it allows them to look at areas of improvement and to be able to choose the best applications.

Two of the companies conducted the LCA themselves within the company [3, 4], and the others outsourced the LCA. Interviewee [3] conducted a LCA himself for his university thesis, and therefore knows how to do it. Within company 4 they created their own version of the LCA. Interviewee [4] acknowledged that his method was not ‘valuated by another company or organisation’ because they only use it for internal purposes.

5.1.6. The use of other methods and tools when practicing ecodesign

Other analyses and methods were also named by the interviewees. Databases are an important source for material selection to two companies [3-4]. Company 3 uses ‘materialenbibliotheek’ and company 4 ‘materialenpaspoort’. Company 5 uses a code of conduct for the companies’ that they work with and they have an internal code of conduct within their company. Certificates are important for company [6] and therefore complying with the conditions became a method for them as well.

5.1.7. Knowledge gained from suppliers

Close contact with suppliers is an important source of knowledge for the companies’. Interviewee 2 uses certificates to check the sustainability of the materials he uses, but says to ensure the sustainability of the supplier, ‘you really have to go two steps further in the line’. He also is in close contact with the manufacturer of his bottles; he recently changed from an English producer to a Dutch one. He wants his bottles to be made from recycled old plastics that ‘have literally been in the same Dutch living rooms before’.

The same goes up for interviewee 5: ‘You have to know where your denim material comes from, you have to know the cotton, the yarn maker, the weaver, who might or might not be the same guy that dyes the denim, then the cloth will go to the factory where the washing will be done. Therefore, it’s quite a
complicated large volume of supply chains and a lot of parties you have to talk to and get a mutual understanding with that you have the same values’. Interviewee 3 also knows the importance of close contact with the supplier. He states that it is important ‘to research the suppliers thoroughly’, because he noticed that sometimes the origin of the resource is not as bright as the supplier might make it seem at first.

5.1.8. Knowledge gained at events

Another important source of knowledge that some of the ecodesign SME’s named is sustainability events [3-7]. The interviewees state that events are used for networking and gathering inspiration on everything that has to do with sustainability. For instance, the environmental beneficial qualities of using sugar cone waste material for the coffee cups of company [6] were learned on one of these events. They are also in networks with the government and other ecodesign connected clubs. The product system of company [5] was also inspired at an event; the owner got the idea of a product system by seeing another company do it on a sustainability event.

5.2. Discussion

In the theoretical framework it is written that Nidumolu et al. (2009) consider the ecodesign challenge for businesses to be: ‘to develop sustainable offerings or redesign exiting ones to become eco-friendly’. To do this successfully, they stated that is required by companies’ to have the knowledge which product or services are unfriendly for the environment. The results from this chapter show how companies’ get to that knowledge. They are discussed in the following subchapters.

5.2.1. Following ‘common sense’ in the ecodesign process

The research question that is being discussed in this chapter regards what knowledge companies’ are basing their ecodesign practices on. Although the theoretical framework focused on methods and tools, it became clear out of the qualitative interviews that the companies’ are at first basing their ecodesign practices on already existing knowledge in their companies’. The general attitude towards ecodesign product development in the SME’s can even be described as ‘following common sense’. This is often combined with a hands-on attitude together with the use of a trial and error approach.

5.2.2. The use of scientific knowledge when practicing ecodesign

Most of the companies’ consulted scientific publications. The scientific publications that are consulted are often more material specific. Besides the LCA, which was widely accepted, methods and tools that are proposed in the field of ecodesign do not seem to be implemented.

A limitation here is that the companies’ operate in different sectors, which can explain some of the differences in the answers. For instance, the interviewed soap manufacturer has already enough relevant experience in making soap and doesn’t need to consult scientific articles, while the design studio needs scientific sources on a more regular basis. In these cases it is more their business focus that determines their use of scientific measures, rather than their valuation of science.

5.2.3. The use of methods and tools by the SME’s

In the theoretical framework various researchers are cited that say there is a low utilization of ecodesign methods and tools (Pigosso et al., 2016; Poulikidou et al., 2014; Prendeville et al., 2017; Rossi et al., 2016). Out of the at least 150 ecodesign models and tools that are developed (McAlone and Pigosso, 2017), only the Life Cycle Assessment was used in the interviewed companies. Guidelines and checklists have also been used by some of the SME’s. It seems that a lot can still be gained by academics that want to get their ecodesign methods and tools to support ecodesign SME’s.
5.2.4. Methods and tools – the LCA

In the theoretical framework of this study the four reasons Lindahl (2005) gives for designers to make use of methods and tools are discussed. The motivations that the interviewed companies’ have to make use of the LCA can fit somewhat into this framework. A combination of reason 1, ‘to what extent the method or tool is experienced as beneficial’, and reason 3, ‘the method or tool’s primary purpose’, is named by almost all of the businesses that use the LCA method. They use the tool to get insight into the life cycle of their product, which makes it beneficial to their design process and is the tools primary purpose.

Lindahl’s (2005) second reason is ‘whether the utilization of the method or tool is in one way or the other required by the customer’. This can also be found back in the results, wherein interviewee [3] acknowledged that they only conduct the LCA when their client asks for it. Although in their case it is not required directly by the costumer, company [6] conducted the LCA solely to show to other companies’ that their product is the most sustainable in the market right now.

Lindahl’s final reason 4, ‘its level of complexity (must not be necessarily complicated to use)’, doesn’t go up for the LCA. As is discussed in the theoretical framework by Rossi et al. (2016), the LCA is a rather complex method. That is what can explain the fact that out of the interviewed companies’ in the qualitative interview only two companies’ conducted the method internally and the rest outsourced the process to specialized companies’. Out of the companies’ that conducted the method themselves, one employs someone with understanding of the tool out of his university degree and the other internally created their own LCA. Especially for the latter of the two it can be questioned if this holds up to the quality of a LCA that is professionally conducted.

The observation that the LCA scores well on three out of four reasons for method and tool utilization that Lindahl (2005) gave, may explain why the LCA is so widely adapted. It has most of the required aspects that make a designer choose a tool. That customers required the interviewed companies’ to use the LCA is another sign of the popularity of the method.

Since both the theoretical framework and the qualitative interviews found such an immense importance of the LCA, it could be interesting to philosophise about extending the tool. Other methods and tools that are developed in the ecodesign field could for instance be integrated into the LCA computer programs, making it a platform for all things connected to designing for the environment. Downside of this approach would be that the LCA is already rather complex, making it so that such inclusions have negative consequences for the tools’ usability.

5.2.5. Design in the first phase of the ecodesign process

In the theoretical framework it became clear that many researchers stated that the biggest environmental impacts can be made in the first stages of the design process (Byggeth and Hochschorner, 2006; Collado-Ruiz and Ostad-Ahmad-Ghorabi, 2013; Luttrup and Lagerstedt, 2006; Poulkidou et al., 2014). This was confirmed by the respondents. This knowledge therefore seems widely accepted by the interviewed sample of the case, Dutch ecodesign SME’s.

Limitation to this observation is that the interviewed companies’ were specifically asked if they thought design in the first phase of the ecodesign process is important. This is likely to have guided their answers. Nonetheless, the importance of the first phase of the design process was underlined.

5.2.6. Suppliers

A source of knowledge that came out of the qualitative interviews but that wasn’t named in the theoretical framework is the suppliers of the SME’s. They play an important role for the SME’s in checking the environmental soundness of the products that are produced. In the end the environmental impact of a product is largely dependent on the materials that are going into producing it. It was noted by an interviewee that controlling the suppliers should be done thoroughly, because they had the feeling that some companies make their goods seem to have less environmental impact than they actually do.
Out of some of the interviews it became clear that suppliers are a potential area where some knowledge can get lost for SME’s. It seems to take quite some resources to research the whole supply line, especially when a material comes from a distant place in the world. For a small company this may be hard to check in person. In those cases the business may have to rely on the information the supplier gives them, which is said by an interviewee to be sometimes presented more positive than they really are.

5.2.7. Events

Another source of knowledge that wasn’t present in the theoretical framework is sustainability events. Out of the qualitative interviews it became clear that knowledge on ecodesign is formed and passed on in corporate sustainability events. They therefore seem to provide an important base of knowledge for ecodesign SME’s in The Netherlands. Interesting for academia is that these events can form a possibility for them to spread their knowledge and observations on ecodesign. The events can potentially provide the stage for a stronger link between the academic and the business worlds.

5.2.8. Leaking knowledge from academia to SME’s

In the theoretical framework there is spoken of low utilization of ecodesign methods and tools (Pigosso et al., 2016; Poulikidou et al., 2014; Prenderville et al., 2017; Rossi et al., 2016). In this research there also isn’t found a high use of ecodesign methods and tools in the research sample. Therefore, there seems to be a lot of knowledge and brainpower going to waste in the relation between academics and SME’s. The field of ecodesign is putting thought into ecodesign solutions, yet the theoretical framework and this study show that few businesses seem to be aware of the knowledge development on universities in their area or don’t know how to make a connection with the academic world.

A solution that can be thought of is the creation of platforms by the universities such as impact hubs and other events, or through students that write theses on ecodesign for the SME’s. This would be in line with what Gosselin et al. (2016) say, they think academia can support ecodesigning companies’.

5.2.9. Suggestions for academics that want to support ecodesign SME’s

In this point of the thesis a suggestion will be made by the author for academics that want their ecodesign methods and tools to be used by SME’s. Knowing how businesses gather the knowledge that they base their ecodesign practices foremost on the visions and intuition of the employees. With trial and error sustainable products are designed. Scientific research is valued. Publications are consulted by a significant part of the interviewees; this is mostly done to research materials. Suppliers and sustainability events are also named as sources for knowledge on ecodesign. From the results it also became clear that the companies’ of the research sample are aware of the in the theoretical framework discussed importance of the first design phase.

Except the Life Cycle Assessment, which is widely used by the respondents, the companies’ do not use any academic ecodesign methods and tools. The Life Cycle Assessment is used by the businesses to
ensure that their products are sustainable and/or to communicate environmental qualities of their products to stakeholders.
6. Benefits and obstacles that SME’s face when practicing ecodesign

In this chapter the benefits and obstacles that SME’s come across will be presented in accordance with the third research question: ‘What are the benefits and obstacles SME’s experience when practicing ecodesign?’ The chapter is again structured in the following way: results, discussion, and conclusion.

6.1. Results

6.1.1. A growing market for ecodesign products

The most widely shared economic benefit of ecodesign that is named by the interviewees is that the environmentally conscious produced goods are increasingly attracting more costumers. All companies noticed that the market for sustainable products is rapidly growing. In the words of interviewee [6]: ‘sustainability has become really relevant. If you are talking about consumer, clients, government, in all fronts it comes back and stakeholders will support you’. He even thinks that it can be turned around, if you’re not investing in sustainable solutions right now, this might become an obstacle in the future. Instead of chasing customers some years ago, the customers now stand in line for the recycled plastics of company [1], and the company is having a hard time to keep up with the demand.

6.1.2. Benefits – corporate image

As reported in the previous subchapter, the companies’ see that the market for ecodesigned products is growing. All companies’ reported that they see that the requirements that customers have for the environmental qualities of their products are increasing. The sentiment was shared by the companies’ that this is good for their corporate image, since they feature these environmental qualities.

Both interviewees [3] and [6] have stated that they like to work with companies’ that share a similar value and mind-set. For instance company [6], which offers a product service that collects the coffee cups they supply, loans waste bins for this goal from a sustainability oriented product service system business. Company [3] works closely together with other ecodesign companies’, and says that they ‘always checks if the values of their collaborators are in line with their own’.

Employee satisfaction was also reported to be positively related to ecodesign. Interviewee [7] underlined her fondness of the ecodesign practices in her company, ‘and of course it makes us feel good, I cannot imagine working anywhere else, it is the coolest company to work for. There is a long-term vision that no other construction companies have’. Besides strengthening the connection with current employees, interviewee [6] adds that it helped the company attract new employees as well.

6.1.3. Benefits – innovation

Company [4] is in the process of creating an environmentally conscious bicycle road made out of used plastics, which upon completion can lower the time it takes to produce a road since they can be laid down in a modular way. In the process, they thought up that they can make these roads hollow, which will allow them to put cables or sewers inside the road. Interviewee [4] noted that this can potentially give economic advantages because the owner of the road can now theoretically rent out these hollow spaces to cable and sewer constructing companies, who then no longer have to dig in the ground to lay their pipes.

The product service systems of company [5] and [6] are innovative in their own ways. Leasing out jeans was ‘unheard of’ and not done before company [5] started with it. People were selling Fairtrade jeans before, but the opinion of interviewee [5] was that this was not good enough because it would also leave waste once the jeans are not being worn anymore. Since company [5] stays the owner of the jeans and therefore the cotton in this new product system the mess will be transformed into a new pair of jeans.
The plastic recycling company [1] is the first plant of its kind in the Netherlands. Another way how sustainable goals have led to innovations is how company [7] build their sustainable homes in a modular way, which makes it easier to reuse the materials after deconstruction, but also makes it possible to expand the homes with more rooms if the customer desires this in the future.

While it might not be an innovation in the most classical sense company [2] uses only natural products which boosts its own kinds of advantages. First off, interviewee [2] told that it is better for the customers’ health that their kitchen cabin doesn’t turn into an ‘chemical factory’. The customers don’t breathe the chemical gasses and it is better for their skin when they touch the soap. On top of that, soaps based on petrochemical substances are bad for the surfaces of the furniture that get cleaned with them. The on natural ingredients based soap will therefore make the lifespan of the furniture longer. Interviewee [2] therefore states that he observes a ‘virtual circle’ that you enter once you start using environmentally conscious solutions. As a result everything will become more healthy, durable, and therefore sustainable.

6.1.4. Obstacles – Wicked problems and trade-offs

Most companies had to deal with considerations regarding the materials they use. Only company [1], which produces recycled plastics, didn’t have to deal with this because ‘their customers make the choice on what kind of recycled plastics they choose’. For interviewee [2] the biggest trade-off was the choice to include perfume in the soap. He recognized the need to make the soap smell good, even if perfume is not an environmental friendly material, because it is the first signal to customers that something is clean. He even goes over the top with his perfume use, making the soap smell as good as possible. This action he then defended by stating that it is important to attract customers to the ‘environmental cause’.

For company [4], who are making a new type of road out of recycled plastics, it is often a consideration between the technical possibilities and environmental concerns. Interviewee [3] declared that there is often a consideration between time, costs, and quality in product development. He noted that environmental improvements would often drive up the price. It is their job to find the good balance, in accordance with the package of requirements that the customer often has. These considerations were very similar to the ones of company [7]. They wanted to implement more sustainability applications in their sustainable home than the customer ended up wanting to pay for. For instance, in the first concepts of their design they ambitioned a wind turbine and a system for rainwater harvesting. These had to be scrapped because they drove up the prices too much.

Company [2] and [7] dealt with materials that are not optimal but that presently don’t seem possible to replace. Company [2] decided to use only natural oil’s and no petrochemical ones. However to still be sold at a price that customers can afford, he was forced to partly use palm oil, a material that is connected to environmental consequences such as deforestation, habitat degradation and climate change. To ensure that the environmental impact of his palm oil is minimized, he ensures that he only uses palm oil with certificates. For company [7] it is still impossible to replace concrete as a base material to keep their home standing on, even though they want to because ‘concrete is evil from a sustainability perspective’.

6.1.5. Obstacles – Higher price of sustainability goods

An obstacle for companies’ can be the higher costs of sustainable goods and the unwillingness of customers to pay for it. Interviewee [6] collaborated with a waste processor that would collect the used coffee cups for them at their customers. It made their system more circular but also drove the prices up, but the customer wasn’t prepared to pay for that (which made them collect the waste themselves).

A wind turbine and a rain harvesting system would be included in the sustainable home of company [7], but not all of their customers were prepared to pay for the higher prices: ‘there is a fine balance in finding out what the people want, they like having a sustainable product, but not to the point that they are spending more money on the systems than on the houses’. Their solution was that the rain harvesting system can be added to the home optionally.

Cases like these have led to customers that think a sustainable product is more expensive than traditional products, which is a reported stereotype according to the interviewees. At the same time, it is
noted by interviewee [1] and [3] that some costumers think recycled products should be cheaper than traditional ones. Their costumers see that it is made of free resources and also assume that the quality is less than a ‘new’ material. This doesn’t have to be the case, according to the interviewees. Interviewee [1] notes that a sustainable product can be more durable and that it doesn’t have to cost more. He adds that it can be the case that sustainable products are more expensive, but that it is the price we have to pay for a better world. According to interviewee [3] it is also the job of the ecodesign companies to combat the costumer’s bad perception of recycled plastics. They do this through communication and try to show that plastic can really be a very beautiful material and that it is a waste to only use it for a couple seconds.

6.1.6. Obstacles – innovation barriers

There are some barriers that make it harder for ecodesign companies’ to implement innovations. For instance, the sustainable homes of company [7] started out as container homes but they didn’t get approved. Interviewee [7]: ‘[the business owners] realised that asking for a license was very difficult. Because it was such a revolutionary type of construction, that very few places would approve that type of construction’. Contractors are used to building in a certain way, and therefore aren’t too willing to take these kinds of risks. On top of that, it is also hard to find a proper design tool that works well with their modular system: ‘there is no digital format for modular systems that is easy. The industry hasn’t moulded itself to modular design’. And since architectural designs are expected to look professional and comply with an industry standard, the architects at company [7] have to work hard to get their designs right.

Getting investments for innovations is also hard for companies that are just starting out according to interviewee [4]. He states that it can be a risky investment for a bank to support a business that hasn’t proven itself yet. If his sustainable road project wouldn’t have gotten the support of an established road building company it would have been hard to get the idea rolling. The idea started in 2013, but only this year, in 2018, is the first bicycle road expected to be completed. Such a long development process wouldn’t have been possible without investments. He sees that there is also another option, which is crowdfunding. He noticed that a successful crowdfunding campaign, however, requires a bit of luck and/or proper backing by media and universities. Company [7] is currently in the process of creating a crowdfunding campaign. Another investment solution has also been taken by company [7], they won a sustainability competition that gave them their first investments.

According to interviewee [5] media attention that came with their innovative approach has been really great to their business. In 2012 they were a small unknown company, but after they put together the words ‘lease’ and ‘jeans’, media from over the whole world picked their story up. The obstacle that came with this was that they weren’t ready to lease out so many jeans yet.

6.2. Discussion

6.2.1. Benefits of ecodesign - Business to Business

In the theoretical framework researchers were cited that state ecodesign companies have benefits on the business to business market (Dangelico, 2016; Plouffe et al., 2011).

Because they produce for other companies, this indicates that there is a trend going on in business to business relations to choose more sustainable materials. The idea that environmentally conscious companies work with companies who share the same values is supported throughout the interviews.

A limitation of this observation is that business to business relations were not the subject of a standard question in the qualitative interviews. The companies’ that are talking about business to business relations addressed the subject themselves. Since this was no actual interview question it is impossible to say if the other interviewees think the differently or the same way.
6.2.2. Benefits of eodesign - Employees

Plouffe et al. (2011) were cited in the theoretical framework to report that through coming together more closely with the values of employees, environmental considerations can boost the motivation of the workforce. In the qualitative interview this sentiment was shared. Even though it was not a standard question in the interview process, two interviewees indicated that eodesign increased the employee satisfaction and forms a benefit with attracting new customers.

These benefits seem to exist for (potential) employees that value the environment and therefore can identify with the business values. What is interesting to think about is what happens if the discussed growing interest in sustainability keeps increasing. Will companies’ that don’t conduct business in a way that values the environment get conflicts with their employees or have more trouble attracting new employees? This could put some pressure on those businesses to apply eodesign.

6.2.3. Benefits of eodesign - Innovation

In the theoretical framework researchers were cited that found that businesses that are engaging with environmental causes are more innovative (Esty and Winston, 2009; Plouffe et al., 2011; Santolaria et al., 2011). In the qualitative interviews innovation turned out to be an enormous influential aspect that correlated with eodesign.

The amount of new business initiatives that the interviewed companies’ brought to life out of their environmental conscious design was truly observable. Eodesign in the researched companies’ means more than mitigating the effects the products have on the environment, it boosts all new company structures and product ideas. Clear expressions of these are the jeans product service, the modularity of the sustainable home, the open spaces in the sustainable road, or the many different original products of the sustainable design studio. But also the soap company, who made a soap which does less harm to people than chemical soap.

The qualitative interview made clear that eodesign can form an opportunity for businesses to think in new ways about their business plans. These new ways seem valuable for the businesses; they seemingly inspire products that feel fresh to consumers who are already perceived as being more interested in sustainable products. It would be interesting to research how the promise of innovation can be used to attract more businesses to engage with eodesign and get it out of the ‘niche market’.

6.2.4. Benefits of eodesign – Growing interest

A significant finding out of the results is that companies’ perceive that the importance of eodesign is increasing rapidly across various stakeholders. They see this as a benefit to practicing eodesign. It gives the businesses perks such as an increasing customer base, more loyal employees, and a value to connect over with other businesses. One interviewee even noted that not considering the environment might turn into an obstacle for companies’ in the future, because it could miss out on having the required minimum standards that stakeholders might have in the future. If that is the case, it is most fruitful to invest in sustainability early on, so the experience can develop and it will not come up as a sudden challenge that the business isn’t prepared for.

6.2.5. Obstacles to eodesign - Price assumptions of eodesigned products

A discovery in the results that wasn’t talked about in the theoretical framework is that the interviewed companies’ perceive that customers have assumptions about the price of eodesigned products. It is noted how some costumers instinctively think that sustainable products are more expensive than traditional products. It is up to the businesses to communicate and sell the advantages that come along with the price. Foremost this will be the mitigation of negative environmental consequences of the product, but it can also entail factors like the longer durability of the product for the costumer or innovative benefits that cannot be found in similar products.
6.2.6. Obstacles to ecodesign - Trade-offs

In the theoretical framework wicked problems and trade-offs are discussed. It was noted in the theoretical framework that ecodesign companies’ have to choose between solutions that accentuate different aspects in the product development phase (Byggeth and Hochschorner, 2006; Prendeville et al., 2017). The general observation on trade-offs that came out of the qualitative interviews is that the ideal ecodesigned version of the interviewed companies’ products is under constant pressure of other requirements.

These other requirements are time, costs, quality, technical possibilities, and attractiveness of the product. The companies’ are trying to get to an optimization, searching to find the most optimal combination of solutions for the problems that they consider important. An example out of the results that illustrates: interviewee [2] attempts to use the most environmentally friendly materials, but compromises by using perfume to create an attractive product. The attractiveness of his product is a problem that he feels he has to solve to sell his goods and therefore compromises on from an ecological perspective.

What becomes clear here is that the trade-offs that are named in the qualitative interviews are setting environmental qualities against other business needs and goals. This is different with the trade-offs that are discussed in the theoretical framework such as the trade-off categorization of Prendeville (2017), wherein environmental qualities are put against each other. It could be that the qualitative interviews in this case give a somewhat more holistic perspective on the business operations of actual ecodesign SME’s. It seems that they have to consider multiple factors besides environmental ones.

Out of the qualitative interviews it appeared that the most important factor that decides these considerations is customer demands. These demands are a possible potential factor that can lead businesses to compromises on the environmental quality of a product.

As discussed in the theoretical framework, Nidumolu et al. (2009) see the ability to generate public support as a requirement to successful ecodesign. That is why trade-offs on the environment sometimes will have to be made. The discussed increased customer interest in environmental products is great news, but will customers still buy products that are more expensive or less attractive to use? To generate public support these trade-offs are sometimes necessary. Furthermore, it is an interesting challenge for the ecodesign businesses, but possibly also for governments or the academic world, to communicate to customers that an environmentally sound product might come with some compromises.

6.3. Conclusions

This chapter researched research question 3: ‘What are the benefits and obstacles SME’s experience when practicing ecodesign?’.

The most recurring benefits of ecodesign that were named in the interviews are that the demand for ecodesigned products is growing, that it improves the corporate image of the company, that it improves business to business relations, that it increases the loyalty of employees to their businesses through working on values that are important to them, and that it provides a new base for innovative ideas.

An obstacle that was named is that pricing of sustainable products can be perceived as being too high or higher than necessary by customers. Trade-offs are obstacles that can stand in the way for companies that want to practice ecodesign: the interviewees said that factors such as production time, costs, quality, technical possibilities, and attractiveness of the product are sometimes chosen over environmental aspects.
7. How SME’s perceive their ecodesign market

This chapter investigates research question 4: ‘How do SME’s perceive the ecodesign market they inhabit?’. First the results will be presented. Then the results will be discussed. Since this chapter deals with subjective perspectives on the current situation of ecodesign in The Netherlands, the discussion of this chapter does not include a lot of theory out of the theoretical framework. The chapter will be ended with a conclusion.

7.1. Results

7.1.1. Growing market

All companies agreed that the market for ecodesign products is growing. In the words of the interviewees: ‘It became a hot topic’ [3] and ‘in the beginning we had to chase customers, now they chase us because everybody wants our product at the moment’ [1].

This also means that the competition is growing, according to the interviewees. For instance, interviewee [4] says that in the road building sector other businesses are working on different sustainable roads that incorporate low temperature asphalt or a lot of recycling methods. There are also businesses that focus on making their processes electrical and buying renewable energy.

Company [6] sees that there is a lot of demand for ecodesigned products now, compared to six years ago when they first started. He says that instead of it only being the pioneers that are busying themselves with ecodesign, there is a real tendency towards more sustainable solutions in the whole packaging branch. He says it is only natural that businesses will copy each other’s solutions. If their business forms a good example, people will follow them, and in the end this will also bring them benefits. It means that there is more attention to ecodesign because the newer players will promote their environmental approach and the method of sugar cone cups, creating more attention to the products of company [6] as well.

When asked if the companies perceive their own impact on the market as impactful, they all think they are. The representatives of company [4] and [7] felt like they made their sectors see that they can build roads and houses differently. Interviewee [2] says that he also had an impact, for instance because the success of his soap allowed his recycled plastic bottle manufacturer to go to bigger soap manufacturers and say: ‘look, this small company can use recycled bottles, why can’t you’.

7.1.2. Collaboration

The companies’ acknowledged the value that collaborating can bring when it comes to producing with care for the environment. The importance of gathering knowledge from other ecodesign companies’ at sustainability events, for example, has already been presented in the results of chapter 5.

Interviewee [3] stated that his design studio found, among other connections, processors of waste on events. They then try to be creative and make products out of this waste. Collaborating can also be done on a more abstract level, according to interviewee [2]. He believes in the concept of open sourcing (wherein all information regarding sustainability should be freely shared) and not patenting innovations. A direct example out of his own business is that he shares the information where he gets the bottles for his soap freely with other companies, because he is convinced that they are the most sustainable option in the country.

Interviewee [6] noted that the collaborations mostly aren’t with similar companies out of the same business sector; the only thing that they share is often that they are committed to ecodesign. This allows the companies to get inspired without thwarting each other. An example of a collaboration they are currently investigating is that when they are picking up the cups in their product service, they will also collect the coffee ground waste so they can distribute this to a company that can work with the material. That other company will then use the material for a circular business plan.
Interviewee [5] stated that through their leasing business model they build up a network of forward thinking people and costumers. These contacts add to their valuable knowledge and inspire them to do better.

7.1.3. Advice to starting companies on ecodesign

All companies’ were asked what their advice for starting ecodesign businesses would be. Interestingly enough the unanimous answer was to have a solid business case [1-7]. Interviewee [1] gave the example that their business model was for a big part reliant on oil prices. When those dropped, the price for virgin plastics also dropped. This suddenly made traditional plastics relatively cheaper than their recycled plastics. A good business model should be resistant against these types of unexpected changes.

Interviewee [7] said that a business model in the end should be shaped to the consumer and not your ideals. Interviewee [3] agrees, and says that people in the sustainability field are often too idealistic so it is necessary to not forget to stay commercial, otherwise the company should be an NGO. He added that one should not get the wrong idea about the amount of work that goes into starting a business. Interviewee [4] noted that it can also be a challenge for a company if technological developments are going slower because of sustainability choices. He noticed that this could be a risk to a company as well.

Interviewee [3] thinks that collaborations are especially important for freshly starting companies, because it helps them show to the industry that they are a serious partner. Working together with an experienced coach who is knowledgeable about ecodesign is also a collaboration that he could recommend. In the beginning they wanted to do everything alone, but now they realize that it is better not to invent the wheel again themselves every time.

7.1.4. Ecodesign trends – Importance of social factors in ecodesign

When asked in what manner the interviewees thought social factors were connected to ecodesign, most respond that they are closely connected but that in practice they are mostly focusing on environmental issues. Social considerations such as not working with child labour are considered self-evident by the respondents and they didn’t have to deal with this kind of considerations in their businesses [1-2, 4, 6-7].

Some social issues were important in the business practices of some of the companies’. For instance, for company [1] the collection of waste is a social factor that is connected to their business. The quality of their product is highly connected to the effort that the consumer puts into separating its waste. Interviewee [7] states that they want to bring about a social change in the construction world, but that it is a by-effect they hope to achieve by building their environmentally conscious homes.

For company [5] social factors are very important, precisely because factors like child labour free production are not as self-evident in the clothing industry as they are for more locally producing companies. One major inspiration for the owner of company 5 to start his jeans leasing and local production company was because he experienced the current situation in developing countries personally. He worked for fashion companies abroad that produce for the whole world with bad labour conditions and wants to move the market away from that.

Company [3] also sees social factors as important to their values, but found that they are more relevant when they are working with developing countries. In the Netherlands they employ someone from a social working place. This is a place where people with a handicap or long lasting unemployment can find work.

7.2. Discussion

7.2.1. Increasing attention for ecodesign

In the theoretical framework it was discussed how publications on ecodesign are increasing in numbers (Luiz et al., 2016; Pigosso et al., 2016). Likewise, the qualitative interviews made it clear that the
interviewees felt that ecodesigned products became more important in their markets and among consumers.

The companies’ that are explored in the empirical study still talked about ‘us’ and ‘them’, wherein the us would be the ecodesign companies’ and the them the businesses that don’t engage with it. In that sense the companies can still be seen as businesses that operate in the niche market of sustainability. Environmental consciousness is in the core of their business. To make a significant impact on the planet, ecodesign should grow even more out of this niche market and become a more natural matter of course for companies’. Luckily, the interviewees indicated that the markets they operate in are currently moving a lot into a more sustainable direction.

The increased customer attention is likely to attract more companies to ecodesign, because the environmentally conscious customers will create a new demand. The discussed business to business environmental requirements will likely also add to the increase in ecodesigned production. Out of the examples in the results it can be concluded that there are many different ways that companies’ in the same sector can pursue sustainability. It can be expected that these new business opportunities will allow the businesses in the same sector to diversify from each other.

7.2.2. Collaborating

In the theoretical it is discussed how businesses that are working with environmental optimization like to work with other companies that share their environmental values (Plouffe et al., 2011). The results of this research confirm this, it became clear that companies’ like to collaborate with businesses that have similar values as they have. This is also in accordance with what was named earlier in the chapter 6.1.1, wherein ecodesign was named as a benefit that creates added value on the market for the business to attract commissions from other companies’.

There was a remark by an interviewee about open sourcing and not using patents. In the example that the interviewee gave he noted that he shares the source of his sustainable bottle freely. A business strategy of sharing environmental knowledge and ideas and making all findings available for others can yield positive consequences for ecodesign companies and therefore the environment. It provides a base of knowledge and helps businesses to not invent the wheel for a second time.

The negative consequence of this business strategy for the companies’ would be that it creates extra competition. In this example it could mean that the manufacturer of the bottles gets extra demand and that this might drive the price of the bottle up, which would be negative for the manufacturer who shared his bottle source. On top of that, not using patents could mean that someone else copies your idea.

Certain negative consequences can make companies’ weary of collaborating and freely sharing ideas with other companies. This sentiment was expressed by an interviewee, who said that collaborating with ecodesign companies who didn’t have the same business focus was beneficial for them, since they could learn a lot from each other without eating up each other’s customer base.

7.2.3. Ecodesign trends – Product services

The in the theoretical framework by Pigosso et al. (2016) observed trend in ecodesign that there is going to be more focus on product services is getting supported by two of the interviewed companies. Company 5, who leases out jeans, tries to still the desire for new jeans that consumers have by leasing out jeans in a subscription form and supplying them with new jeans when they desire. The garment then stays property of the company, and they repair them when they are broken. If they are not able to be sold as a ‘vintage’ model because they are to worn out, they will remanufacture the materials of the old jeans into a new pair. Company 6 also works with a product service system; they collect the used coffee cups at their customers and make new out of them.
7.2.4. Ecodesign trends – Importance of social factors

Social factors are said to become a more important factor in ecodesign (Hellweg and i Canals, 2014; Pigosso et al., 2016). This importance could be found back in two of the interviewed companies’. These businesses shared that they are involved or have been involved with developing countries, wherein social factors are more on the foreground than in The Netherlands. The other interviewees noted that they felt social factors are closely connected to ecodesign, but that they just don’t have to deal with them. This means that the sentiment on social factors does line up with the discussed trend in ecodesign, but that the relevance of them differs between businesses.

7.3. Conclusions

The research question that was researched in this chapter is, ‘How do SME’s perceive the ecodesign market they inhabit?’.

All companies felt that the markets they inhabit are changing rapidly to more environmental friendly ones. They see a general increase of interest with their stakeholders, be it costumers or other businesses. Competing businesses in their field are perceived to be changing towards ecological friendlier alternatives as well.

Collaborations with other businesses are deemed important. The interviewees report that there are a lot of events that centre on sustainability themes. Being open about ecodesign knowledge is valued among the ecodesign businesses but collaborating with companies’ that share the same business focus is done more cautiously.

The businesses unanimously stated that it is important for ecodesign companies’ to have a good functioning business plan that makes profits. It is a perceived trap for ecodesign businesses to be too idealistic and focused on the environment alone.

The trends of product services and the inclusion of social factors in ecodesign are found in the research sample. Two of the companies’ make use of a product service system. Out of the interviews it became clear that social factors are universally acknowledged as important, but that they are not relevant to all businesses. They are especially relevant for companies’ that have relations with developing countries.
8. General discussion and future research

In the previous four chapters the research questions were separately presented. In this chapter a general discussion is given. Some of the gained insights out of the different chapters will be revisited and linked to each other.

8.1.1. Motivation and benefits of ecodesign

Although in this research they are separated by two different research questions, it became clear that there is only a very thin line between the motivations to practice ecodesign and the benefits that they deliver for the SME’s. As is discussed, some of the drivers for ecodesign that were named in the theoretical framework came back as benefits in the qualitative interviews. It is not unimaginable that if the questions would have been asked in a different way, they would have overlapped in the categories.

8.1.2. Trade-offs and tips for starting companies

The in chapter 6 discussed insight that customer demands are an important factor in trade-off decisions ties in well with what all interviewees gave as a tip to starting ecodesign businesses: to have a good working business model (as discussed in chapter 7). The ideal environmental qualities that the SME’s of the research sample would have liked to implement could sometimes not be realized due to other factors. It is discussed that these factors usually had to do with the customer demand. Therefore, trade-offs seem to be made in favour of having a solid business case.

8.1.3. Academic support and trade-offs

As has been discussed in the theoretical framework by Nidumolu et al. (2009), businesses that practice ecodesign have to be knowledgeable on what makes a product harmful for the environment. Chapter 5 of this research focused on the knowledge sources on ecodesign that SME’s use. Part of the chapter looked at academic support to ecodesign companies’. The thesis so far didn’t go into one consideration: do companies’ actually benefit from extra academic knowledge, methods, and tools? Currently they seem satisfied with for instance logical thinking and the ‘trial and error’ approach.

The author of this thesis wants to argue that there is at least one area that could benefit from further integration between academics and businesses, which is the acquiring of data to make decisions on trade-offs more informed. This is relevant because the research in chapter 6 of this thesis found that trade-off decisions are indeed a major part of ecodesign at the interviewed companies’. Academic methods and tools can help businesses, because knowledge helps making trade-off decisions easier. Databases that provide insight in the material life cycles can for instance help an SME to make an informed choice between materials on environmental impact. Data on what the customer wants and what they are willing to pay for can provide information on what businesses need to implement in their product and what they can leave out.

Although it is debated by Byggeth and Hochschorner (2006) in the theoretical framework if technical tools are actually sufficient for making trade-offs, the author of this thesis thinks that technical knowledge that for instance comes out of the Life Cycle Assessment is one of the only sources businesses can use that goes beyond factual knowledge from suppliers or theorizing about the sustainability of a product. Therefore working on improving the data that such tools can provide is a way academia can help SME’s to make more informed choices.

8.1.4. Critique on sustainable growth

Although this doesn’t relate directly to the research objective, the author of this thesis would like to make a statement on ecodesign in this subchapter.
In the theoretical review of this research the discourse of Sustainable Development was discussed. It was noted that it is debated if ‘sustainable growth’ can be possible (Dryzek, 2013). A similar problem to the oxymoron that is ‘sustainable growth’ can be observed with the concept of ecodesign. It can be reasoned that most ecodesigned products are ultimately not contributing to the footprint of the people on planet earth. Only if true circular models can be achieved and resources grow back ‘faster than’ or ‘equally as fast’ as they are being extracted and aren’t using toxic or other harmful substances, is worldwide production coming close to being truly sustainable. But it is easy to see that most products are not even coming close to that ideal.

That is also the aspect that ‘itches’ the most with the author of this thesis. Some of the discussed benefits of ecodesign such as economic benefits or the possibilities for innovations are factors that can ultimately lead to more production. If ecodesign is only the next vehicle for the market to expand on, its positive environmental influence can be quickly lost since it can turn into a platform for more resource distraction. The most critical but obvious note that therefore has to be placed next to ecodesign is thus that if the people of the earth truly want to be more sustainable, they should consume less. Consuming ecodesigned products is only a step in the right direction and cannot be an excuse for more growth and resource extraction.

8.2. Future research

This research has opened up some new areas that could be studied in the future. They will be set out in this subchapter.

8.2.1. Dated literature on ecodesign

Since a lot of the literature on ecodesign drivers and barriers is already one or two decades old (Luiz et al., 2016; Pigosso et al., 2016), and the respondents in the interviews indicated that in the last couple of years they’ve seen that the market has generally changed towards a more environmental consciousness, there is a need for more updated research on topics such as the motivations and benefits of ecodesign. The fact that the interviewees indicated that the role of the government is growing as well also adds up to the perspective that the ecodesign field is really changing and that updated knowledge is needed.

8.2.2. The use of ecodesign motivation for the promotion of ecodesign

As has been discussed in chapter 4, the motivation for the interviewed companies’ to apply ecodesign came for a large part out of the desire to change an already existing business sector towards an environmentally conscious one. Knowing that people are looking at their field of work and consider how to practice it in a more sustainable way is a promising indicator that other people are prepared to do the same thing. The author of this thesis therefore wants to suggest that this information can be valuable for governmental organisations, researchers, or anyone else that wants to assist businesses in becoming more sustainable.

Researchers could study how other companies’ can be motivated to make a similar change in their sectors. It can for instance be researched how the benefits that were named in this study such as better employee loyalty, boosted innovation, and a growing market for sustainable products can be used to promote ecodesign in those businesses.
9. General conclusion

The research objective of this thesis was to investigate how and why SME’s practice ecodesign. Through qualitative interviews with 7 ecodesigning SME’s in The Netherlands some conclusions have been reached.

Motivations for the researched SME’s to practice ecodesign were that it provides new business opportunities and that it improves the corporate image. The SME’s also had an internal desire to change production to benefit the environment. Besides that they practiced ecodesign out of (expected) government legislation.

It was found that the knowledge that is used to ensure that the properties of the products are environmental friendly comes from experience from the employees, ‘common sense’, the suppliers, scientific publications and sustainability events.

The SME’s experience the following benefits of practicing ecodesign: the demand for ecodesigned products is growing, it improves the corporate image of the company, it improves business to business relations, it increases the loyalty of employees to their businesses through working on values that are important to them, and it provides a new base for innovative ideas. Necessary trade-offs on other business objectives form an obstacle to practicing ecodesign.

Lastly, the businesses all felt that it is required to have a strong business model. They found it important that ecodesigning business should not let idealism go before making profits since this could lead to bankruptcy.
10. Reference list


Earth Overshoot Day 2017 is August 2, the earliest since ecological overshoot began in the early 1970s, 2017. . Earth Overshoot Day.


https://doi.org/10.1016/j.jenvman.2009.06.018

38


Lindahl, M., 2005. Engineering designers’ requirements on design for environment methods and tools. KTH.


Ritzén, S., 2000. Integration environmental aspects into product development: proactive measures. KTH.


