Exploring persuasion in the design of a sustainability accounting service

Master's thesis in Interaction Design and Technologies

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Cover: The transactions view from the final high-fidelity prototype of the Normative software.

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Abstract

This master thesis explores the relatively new design space of products that attempt to persuade companies to become more sustainable. Research through design has been applied by working with a company called *Normative* and their web application, which lets companies measure a number of sustainability metrics from data about all the purchases that the company has made.

For this purpose, relevant theory has been reviewed, and potential users have been interviewed. Using the insights from these activities, a new prototype of Normative's product, that attempts to persuade companies to become more sustainable, has been created. With insights gained from this design and research, a set of challenges that need to be considered when creating products that attempt to make companies more sustainable have been formulated.

Acknowledgements

Contents

Contents

List of Figures

1

Introduction

2016 was the warmest year ever measured on Earth, making it the third year in a row to break that record (NASA's Goddard Institute for Space Studies 2017). There is also an impending risk for a large set of alarming problems, such as erosion of soil, rising sea levels, and reduced access to fresh water (Brown 2010:39-68).

Since many of these problems are effects of humankind's excessive consumption, it is evident that changing the human behaviour into being more sustainable, and also changing the way companies and governments are being run, could have a great impact on Earth (Brown 2010:39-68).

In order to aid this change in behaviour, there have been attempts to use human computer interaction to help people behave more sustainably (Azaria et al. 2014; Meurer et al. 2016; Joulebug 2017). Some of the attempts focus on the environmental impact of the way people behave in public spaces, such as work places (as opposed to focusing on single individuals) (Foster, Linehan, and Lawson 2014; Katzeff et al. 2013). These pursuits tend to focus on internal company behaviour, such as turning off the lights, eating and traveling more sustainably. However, less researched factors are corporate actions of how a company interacts with the rest of the world, such as purchases, investments and shipping. If these factors are taken in to account it could be possible to obtain a more holistic view of a company's sustainability impact.

1.1   The product Normative

The salvation of planet Earth and the human species would seem to be enough incitement for companies to act more sustainably. However, the lack of quantitative analysis of the impact that individuals and companies produce makes it hard to track the progress and to set goals.

The team behind Normative (2017a) has the vision of a society built on values of sustainability. Their product is a software that companies can use to quantify and visualize environmental data in a graspable way, aiding them in improving their sustainability impact (ibid.). By doing so it collects data from the user's company such as purchases and driving logs, and then uses computer science and artificial intelligence to present metrics such as carbon dioxide emissions, water

use and electricity to give an assessment on how sustainable the company is (ibid.). Normative also has planned features for setting company specific sustainability goals and creating non-financial statements to disclose to governments (ibid.).

EU regulations

The European law has by 2013 (European Parliament 2013) and 2014 (European Parliament, Council of the European Union 2014) started to take sustainability into higher account. More specifically, the directives make companies present non-financial statements in a similar way as they do with financial statements (European Parliament, 2013, 2014). Furthermore the member countries of the European Union then have to create laws that implement the directives, since the EU laws are superior to the laws of each country (European Commission 2017). This puts further pressure on EU-based companies to stay within the emission limits and to keep working to be more sustainable. In Sweden the law is implemented as forcing a company to present a non-financial statement if more than one of the following criteria are met:

- Number of employees above 250

- Total assets above 175 million SEK

- Sales are above 350 million SEK

(Regeringskansliet, 2016)

Normative's view on sustainability

According to one of the founders of Normative, Kristian Rönn, the company defines sustainability as:

"*Maintaining the well-being of all sentient beings over time.*" (Kristian Rönn, personal communication, February 8, 2017)

The definition is a further development of two other views on sustainability. The first is made by Bostrom (2013) and defines sustainability as:

"*Existential risk prevention*"

The second one, made by Waidema (2017) states that the goal of sustainability is to maintain human well-being, thus influencing Normative's definition.

To further divide this definition of sustainability into more concrete indicators, Normative has identified metrics for which there are scientific support to have an effect on the amount of year humans or animals live (Adam Wamai Egesa, personal communication, May 25, 2017). Examples of these indicators are for example global warming and land occupation (ibid.). Decreasing (or, depending on the indicator, increasing) these indicators will thereby in theory increase the chances that the

well-being of sentient beings is being maintained over time(ibid).

We believe that a software like Normative could offer useful tools for companies to disclose the necessary non-financial reports to governments and, more importantly, improve their sustainability impact.

1.2 Aim

The aim of this study is to investigate how and if *persuasive design* can be used to influence companies and organizations to be more sustainable. Persuasive design is design that attempts to change the behaviour of the user into a desired one, and will be covered in 3.3. In order to test different design options, we will develop prototypes in an iterative manner, evaluate these with potential users and learn from the feedback we get. The result of the study will be a set of challenges to consider when creating similar products, as well as our thoughts on them. The result will also include a prototype developed that should be viewed as an example on how the research can be used.

1.3 Research Question

The question that has been research in this thesis is the following:

"*What challenges are involved in creating a service that persuades and informs a user - who works with sustainability reporting - to make calculated decisions in order to advise their organizations to become more sustainable?*"

1.4 Delimitations

Sustainability is a highly complex concept that covers many connected aspects such as environmental, social, and economical. For the purpose of this thesis, we will be using Normative's definition of sustainability, mentioned in 1.1, and the indicators of sustainability that their employees have chosen to focus on. Based on this definition, Normative has created a back-end service that performs environmental calculations, on which the prototypes that we create will depend.

2

Background

This chapter gives a background and describes the problem domain, more specifically regarding *Sustainable Development* and *Persuasive Technology*. It then describes the previous research that has been done in trying to change peoples behaviour using HCI, with a special focus on research that attempts to make people act more sustainably.

2.1   Sustainable development

In 1987, the World Commission on Environment and Development (1987) wrote a report, called *the Brundtland commission*, named after its chairperson Gro Harlem Brundtland, for the UN which laid the groundwork for UNs work on sustainable development throughout the world (Shepard and Donlon 2007). The report famously defines *sustainable development* as:

"*...development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*"

The authors urge the UN to act towards a more sustainable world, and claim that the security, well-being, and very survival of the planet depend on it. Brown (2010) goes as far as saying that in order to prevent the crisis we need to mobilize with the speed and determination as if we were at war. This suggests that the sustainability problem is urgent, perhaps now more than ever before.

2.2   Persuasive Technology

Tools that attempt to change attitudes or behaviours are called persuasive technology. Fogg (2013) has written much about the design of these tools, which is called *persuasive design*, and has created a set of strategies that can be used to persuade users, described in section 3.3. Fogg (2009b) also created a design process to follow when creating such products described in section 4.4.

2.2.1 Persuasive technology for sustainable behaviour

There have been several attempts to use HCI as means of changing individuals to act more sustainably. Azaria et al. (2014) successfully managed to get people to consume less energy from the climate control in their cars by showing advices on a display. Meurer et al. (2016) investigated the possibility of using persuasive technology to get elderly people to travel more sustainably.

There are also plenty of mobile apps that attempt to promote a sustainable overall behaviour, such as JouleBug (2017), Rippl (2017), and apps that promotes car pooling such as Uber (2017) and Sunfleet (2017).

2.2.2 Persuasive technology to increase sustainability in the workplace

Some attempts have been made regarding sustainability persuasion in the workplace. One study conducted by Katzeff et al. (2013), involved live feedback of the current power consumption. The so called *Watt-Lite* prototype was according to the authors supposed to act as an ambient information source in the physical space. This was implemented as three over-sized electric torches where each light circle could represent different aspects of the electric consumption, such as minimum/maximum electrical use during the day or electricity used during production/non production compared to the current electricity used. They were distinguished between using different colours, and the electric consumptions itself had a positive correlation to the diameters of the light circles (the larger circle the higher electrical consumption) (Katzeff et al. 2013).

An interesting point made by a test participant in the study is regarding a recoil effect of this type of feedback:

"*If this is going to be useful for decreasing consumption I have to see that I influence the whole thing. We switch off all the lights, but if this saving isn't visible, then it becomes uninteresting.*" (Katzeff et al. 2013)

Katzeff et al. (2013) state that this problem also regards the opposite way, where the workers see that the electricity consumption is too high according to the presented data, but that there is nothing to cut down on. Another problem was that the size of the power consumption usually had a positive correlation to the money made by industrial companies (ibid.). The study even showed that some participants read larger sizes as a good thing and had no idea that the tool was designed for sustainability (ibid.).

Another study that attempted to influence the people at a workplace into a more sustainable behaviour was Foster, Linehan, and Lawson (2014). The authors designed and evaluated an intervention in end-user energy demand, and developed a set of guidelines on how to implement interventions at workplaces successfully.

These guidelines involved six parts that are important to think about to achieve a pro-environmental workplace.

- **Incentives** - According to the study, incentives work well when the rewards are highly visible and have frequent progress updates (Foster, Linehan, and Lawson 2014).

- **Engagement** - To engage people in the workplace it was found that competition and negotiated target goals were beneficial (Foster, Linehan, and Lawson 2014). According to the authors unrealistic goals were important to avoid.

- **Openness** - The study pointed out that a company had to be open enough for the employees to be able to see why savings regarding energy were done (Foster, Linehan, and Lawson 2014). The risk was otherwise that the employees did not accept the reasons for the savings and got a cynical view of the company (ibid.).

- **Leadership Role** - Foster, Linehan, and Lawson (2014) state that commitment from the management was important for the intervention to take effect, since this would lead to change happening from the top and then *"trickling down"* on the rest of the organization. Charisma was also said to be an important trait for leaders to have in order to inspire action (ibid.).

- **Communication** - The mode of communication was less important according to Foster, Linehan, and Lawson (2014). More important was instead the quality of the message. The communication could cover educational workshops in energy consumption and continuous feedback of the organizations energy consumption.

- **Visualization** - Regarding visualization Foster, Linehan, and Lawson (2014) state that *Bar Charts*, *Line Graphs* and organization-centric metrics such as cost, were preferred.

2.2.3 Critique against persuasive design

Brynjarsdottir et al. (2012) lay out some critical points about the way persuasive design within sustainability has been studied. According to the authors, persuasion within sustainability is based on a limited framing of sustainability, human behaviour and the relationship between the two. The limited framing that is done, narrows down the focus in a way that can make sustainability more manageable and measurable (ibid.). According to the authors, persuasive products often try to optimize a single metric, which can lead to incorrect calculations and a non-holistic view of the sustainability.

A problem with this approach is that it can make the user believe that their sustainability is being measured, but in reality this is only based on a very narrow view of sustainability (ibid.). Another problem that the authors discuss is that the metrics

that are not measured by the system can be consumed without consequence, so that users might tend to overuse these, and attempt to reduce the once that are being measured (ibid.).

In addition to this, Brynjarsdottir et al. argue that many of the papers written about persuasive design lacks user evaluation. The papers that do evaluate often do not do so for longer than 3-4 weeks, which according to the authors likely is not enough to go beyond novelty effects (ibid.).

3

Theory

This chapter describes theoretical concepts that relate to persuasive design, non-financial reporting and environmental psychology. The emphasis is on the guidelines and design process, developed B.J Fogg, that relate to persuasive products.

3.1 Psychology

Persuasion builds upon ideas from psychology. The fields of behaviour and motivation were studied long before the specific field of persuasion itself. This is why this section will cover behaviourism and motivation and how they relate to persuasion.

3.1.1 Behaviourism

According to Skinner (1974:3) behaviourism is not the science of human behaviour, but rather the philosophy of that science. This field has been very prominent regarding adjusting behaviour, in particular Skinner's analysis of *Operant Conditioning* of learning through consequences (Passer et al. 2009:293-294). In his experiments, Skinner used reinforcements and punishments in order to strengthen or weaken a behaviour (Passer et al. 2009:294). A great difference between Skinner's research and previous research done on *Classical Conditioning* (like Ivan Pavlov's experiments on dogs), which focused on elicited involuntarily behaviour (like reflexes and salivation), Skinner's research instead was operant, focusing more on voluntary behaviour. (Passer et al. 2009:289-295). In other words, Skinner's theories can be seen as more humane since they offer a choice to the subject instead of hard coding it into them. This makes this kind of science more ethical and appropriate for persuading psychology.

Shaping and *Chaining* are other methods that can be used advantageously to reach a final behaviour (Passer et al. 2009:303). Shaping consists of reinforcing all small sub-behaviours that lead to the final one. This might speed up the process since one does not need to wait for the final behaviour to occur in order to reinforce it, rather the first step towards it (Passer et al. 2009:303).

Chaining is similar to shaping and consists of using the consequence that occur after

a desired behaviour as the antecedent for the next behaviour and so on in a chain until the final desired behaviour is met (Passer et al. 2009:303).

3.1.2   Motivation

According to Passer et al. (2009:475-476), motivation is a process that has influence on direction, persistence and vigour in goal-directed behaviour. Passer et al. state further that two systems are central in motivation, namely *Behavioural Activation System (BAS)* and *Behavioural Inhibition System (BIS)*. BAS encourages action by promising potential rewards, while the signals sent in BIS instead motivates by threatening with potential punishment (Passer et al. 2009:476). BAS and BIS together make sure that the human maximizes pleasure and minimizes pain (Passer et al. 2009:476).

Another important factor in motivation is the *expectancy x value theory* (Passer et al. 2009:477). The expectancy denotes a person's expectation that a certain behaviour will lead to a goal, while the value means the person's incentive value if the goal is achieved (Passer et al. 2009:477). Goal-directed behaviour is affected by the level of these two (Passer et al. 2009:477). The higher the levels of expectancy and value are, the stronger the goal-directed behaviour becomes.

3.1.3   Environmental psychology

Even though climate change is a global threat and there is a lot of knowledge about how people should act in order to reduce it, many people do not adjust their behaviour accordingly (Gifford 2011). Gifford (2011) lists the *Dragons of Inaction*, reasons that people do not act sustainably. Such reasons could be as simple as ignorance about emerging threats, but it also includes more unexpected phenomenas, such as the fact that people often believe that environmental management is worse in other places than in their own. Other reasons listed are that people can be overly optimistic about the future, or the belief that religion, capitalism or technology will save humanity. There are also social factors, such as norms and networks that push people to act in the same way as other people do (Gifford 2011).

3.2   Persuasion

Gass and Sieter defines persuasion as:

   "*...a process that involves one or more persons who are engaged in the activity of creating, reinforcing, modifying, or extinguishing beliefs, attitudes, intentions, motivations, and/or behaviors within the constraints of a given communication context.*" (Gass and Seiter 2014).

Human beings live in a complex world, and thus we need to create shortcuts such as stereotypes and rules to be able to make decisions (Cialdini 2006). These rules can

be studied and used to influence peoples behaviour. Cialdini lists different principle of influence that people generally follow. For example, he lists social influence as such a principle. This principle suggests that people tend to do what people around them do, especially in uncertain situations (ibid.). This is the reason why laughing tracks are so successful in making people laugh along (ibid.).

3.3 Persuasive Technology

Fogg (2013) defines a persuasive technology tool as:

"*...an interactive product designed to change attitudes or behaviors or both by making a desired outcome easier to achieve*"

Further he defines *persuasive design* as the design of this kind of technology.

The study of computers as persuasive technology, called captology, is concerned with the use case of users interacting *with* computers, rather than through (Fogg, B. J. 2013). An example of a user interacting through a computer is someone using an instant messaging app to communicate with someone. In this case the computer facilitates rather that persuade (Fogg, B. J. 2013).

There are many examples of persuasive technology that have had their breakthrough in the last years, such as Duolingo (2017), an app for learning languages and Lifesum (2017), an app that pursues its users to eat better and exercise more.

Persuasion can occur on two different levels, macro and micro, called macrosuasion and microsuasion (Fogg, B. J. 2013). At macro level, persuading the user is the sole reason that the product exists. Microsuasion however, uses persuasion to enhance the functionality of an app that has some other main purpose(ibid.).

3.3.1 Factors of persuasion

According to Fogg (2009b) when a users do not behave in a specific way, there is a lack in one or more of the three factors:

- **Motivation** - Sufficient motivation for the behaviour

- **Ability** - Sufficient ability for the behaviour

- **Trigger** - An event that triggers the desired behaviour

3.3.2 Strategies for persuasive technology

Even though all of the factors are required for an action to take place, it could according to Fogg (2009a) often be most effective to focus on the ability. Fogg states further that a high motivation may not be enough if the users lack of ability

makes it impossible. Because of this Fogg means that it often is better to increase ability/making the behaviour simpler, in order to get the desired behaviour change.

Fogg describes seven types of persuasive technology tools, listed below:

- Reduction

- Tunneling

- Tailoring

- Suggestion

- Self-monitoring

- Surveillance

- Conditioning

3.3.2.1 Reduction

By reducing the number of steps that are required to perform a complex task, users could be more inclined to execute them. As humans seek to minimize cost and maximize gains, a simplified interface can result in more people using the service. (Fogg, B. J. 2013).

As an example, Amazon has launched different physical buttons that could be placed in the users home, and pushed to instantly order different items from Amazon (Amazon 2017; Dolan 2017). The buttons had different brands on them, such as "Red Bull", used to order the energy drink Red Bull, or "Tide", used to order washing powder from the brand Tide. The buttons eliminates many steps that are otherwise necessary to order them items, such as accessing a phone or computer, go to amazons web page, find the item and check out.

3.3.2.2 Tunneling

Tunneling, or guided persuasion, is a method to lead users through a predetermined sequence of actions or events (Fogg, B. J. 2013). Examples of this are different tours and guides found on both the web, and in desktop and mobile applications. A common use case is installations and sign up forms, where the designer can guide the users though the process, as well as introduce the different features of the product (ibid.). When the user enters a tunnel, the designer gets more control of what is presented to the user, and thus has the chance to influence or teach the user (ibid.).

3.3.2.3 Tailoring

Information tailored for the user appears to work better to pursue users (Fogg, B. J. 2013). This can be done for example by showing information relevant to the geographical area where user currently is or by tailoring information to the user's education level (ibid.).

3.3.2.4 Suggestion

Fogg defines suggestion technology as an *interactive computing product that suggests a behavior at the most opportune moment* (Fogg, B. J. 2013). Suggestive technology makes suggestions to behave in a certain way at the time that the user is motivated to follow the cue. An example of this is thepihut.com, that presents different accessories to items that the user places in the shopping cart (ThePiHut 2017). Making the suggestion at the right time is essential for the it to have an effect (Fogg, B. J. 2013).

3.3.2.5 Self-monitoring

The core point of self-monitoring according to Fogg, B. J. (2013) is to eliminate the tedium of tracking data oneself. This data could be about performance in different activities, or any other data that the user wishes to track. Ideally the data is presented to the user in real time, letting him/her know how well the performance is compared to the target goal, which, according to Fogg, B. J., increases the likelihood that they will keep up the target behaviour.

3.3.2.6 Surveillance

Fogg (2013) states that observation of the user can be used for persuasion. However he emphasizes the importance of using overt as opposed to covert surveillance. Covert surveillance implies that the recording device is hidden and not known to the observee (ibid.). In this case the installation is however not persuasive, since it only becomes a secret monitoring technique (ibid.). In overt surveillance on the other hand the observee knows about the system and acts in a way that pleases it (ibid.). This means that the actual behaviour is adapted (as opposed to the covert system where only the behaviour is monitored, even if it is not the desired behaviour) (ibid.).

Fogg, B. J. also notes that a problem with surveillance can be that it only persuades when the surveillance is happening, and not otherwise. Therefore, it is important to strive for internalization of a behaviour, as opposed to only compliance with it (ibid.). Further, Fogg states that it is more effective to prevent unwanted behaviour, rather than punishing the user for it afterwards.

It is mentioned that ethical questions are raised by surveillance, especially concerning privacy and dignity of individuals (Fogg, B. J. 2013).

3.3.2.7 Conditioning

Conditioning uses *operant conditoning* (as mentioned in 3.1.1) which uses positive reinforcements or rewards in order to create or shape a behaviour.

In video games conditioning is often used by rewarding the player's behaviour using things like power ups, visual and sound effects (Fogg, B. J. 2013). Fogg states that most effective positive reinforcement is done by placing it directly after the behaviour to be enforced. However it is not needed for the reward to occur every time the behaviour is done, instead Fogg states that the most effective reinforcement is done by having the reward appear at an unpredictable frequency.

The use of conditioning is controversial in some circles nowadays and should be used with caution to stay within ethical limits (Fogg, B. J. 2013).

3.4 Measuring the environmental impact of companies

So far this chapter has described different ways to influence individuals behaviour, however, there are also ways that governments and alike attempt to influence the environmental impact of companies. Laws and regulations are ways to do so, but also the act of reporting the environmental impact of a company, thus increasing the transparency of it, can have a positive impact (HG org Legal Resources 2017; Perrini 2006).

3.4.1 Non-Financial reporting

Non-financial reporting is the act of compiling information about a company's non-financial impact, such as social and environmental (Perrini 2006, 73). Corporate social responsibility is an increasingly important issue for big companies (ibid., 73). Getting a shared understanding of what the company represents and how it contributes to society is a way to be perceived as trustworthy and help companies make profit. Non-financial reporting, henceforth NFR, is a tool for companies to disclose information about the its impact on social and environmental issues to the public and to its stakeholders. NFRs can help companies identify areas of the organization were improvements can be made. While many big European companies use NFRs, there is a great flexibility to what the companies need to disclose (European Parliament 2013) (Perrini 2006, 74). The NFRs are generally integrated into annual or quarterly financial reports.

4

Methodology

This chapter describes two well-known design processes, the iterative design process by Rogers (2013) and the Goal-directed design process by Cooper et al. (2014), and then a third design process specifically developed for persuasive technology, developed by Fogg(2009). It also outlines different design methods used for research, ideation, prototyping and evaluation.

4.1 Research through design

Research though design is the process of creating designs in order to gain insights about different design options for a certain situation (Gaver 2012). This report describes such a research, and its results can be used for designers who wish to draw knowledge about the resulting design and discussion.

4.2 Roger's Process of Interaction Design

The Interaction Design Process, according to Rogers (2013), consists of four activities as seen in Figure 4.1. As seen in the figure the process is iterative since it is looped over several times, which can be advantageous when improving a design rather than doing it once (which could make the development static and improvements harder to obtain at a late stage).
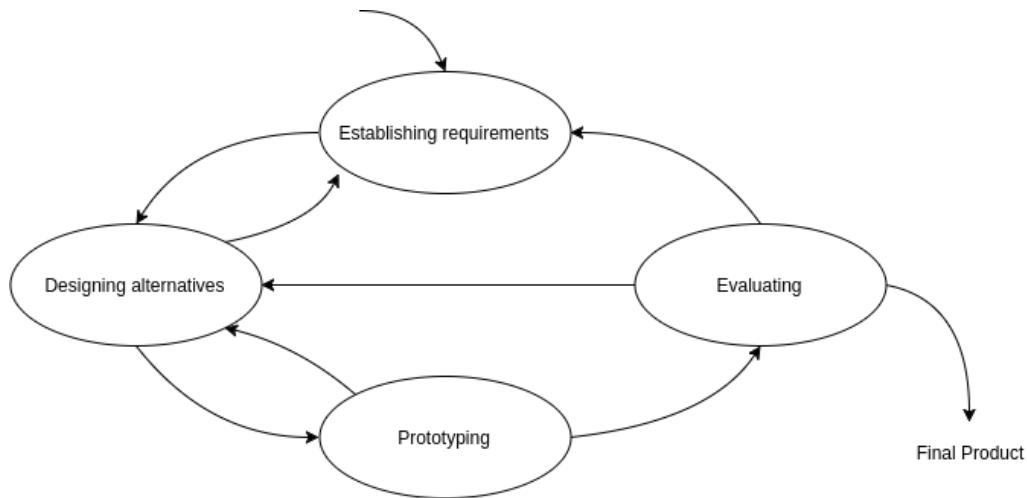
Figure 4.1: Roger's (2013) Interaction Design Process model. The arrows represent the path one can take in the process.

4.2.1 Establishing Requirements

Rogers (2013) writes that one must know who the target user is and what kind of support they can gain from the product that is to be designed. This knowledge becomes the basis of the requirements of the product (ibid.). Data gathering and analysis are central in this establishment (ibid.).

4.2.2 Designing Alternatives

In this stage ideas are suggested to meet the requirements. Sometimes this activity is divided into *Conceptual* and *Physical Design* (Rogers 2013). Conceptual Design consists of finding a model that explains what can be done with the product and what concepts are needed to understand in order to interact with it (ibid.). Physical Design, on the other hand, denotes the physical details of the product such as colour, sound and menu design (ibid.).

4.2.3 Prototyping

According to Rogers (2013), the most sensible way to evaluate a design is to interact with it. In order to interact with it however, a prototype has to be made (ibid.). This could be either low-fidelity or high-fidelity depending on the project and depending on the current project phase (ibid.).

4.2.4 Evaluating

In the evaluation stage, the usability and acceptability of a product are supposed to be determined (Rogers 2013). Evaluations can be done with users in controlled or natural settings (ibid.). They can however also be done without a user, for example using *Heuristic Evaluation*, where heuristics are checked whether they are fulfilled or not (ibid.).

4.3 Cooper's Goal Directed Design Process

Cooper (2014) presents a design paradigm called Goal-Directed design in his book *About Face*. According to Cooper, fulfilling the user's goals is crucial for good design, and identifying these goal should be a major part of the design process. Cooper also suggests a design process, called The Goal-Directed Design process, consisting of 6 steps (Cooper et al. 2014:23), summarized below:

- **Research** - According to Cooper, qualitative methods usually give a better understanding of users. The user research should be combined with a literature review and other knowledge relevant to the project. Cooper (2014: 44) advocates the use of the *Contextual inquiry* method, described in section 4.5.1.2.

- **Modeling** - In this phase the data from the research should be used to generate *personas*, which are models of hypothetical people that represent typical users of the system (Cooper et al. 2014:62).

- **Requirements** - In this phase the personas are used to create scenarios, which are descriptions of how the personas use the system in order to reach their goals (Cooper et al. 2014:105). The scenarios are then used to create *requirements*. In order to retrieve the requirements the sentences from the scenarios are broken down into *objects*, *actions* and *contexts* (Cooper et al. 2014:116). In short action refers to what i happening, object refers to who or it this is happening to, and context refers to the context where it takes place.

- **Framework** - Designing the framework of the product involves defining the overall structure of users' experience (Cooper et al. 2014: 119). This involves creating the interaction framework, sketches of the screens and their behaviour, the visual framework and other specialized frameworks. The designer should use scenarios and requirements as the basis of the design (ibid.).

- **Refinement** is the phase in which the interaction framework can be refined into a prototype that shows the interface at pixel-level (Cooper et al. 2014: 139). Every primary view and dialog of the inteface should be covered by this prototype (ibid.).

- **Support** to the developers is important, as design changes might need to be

made to meet deadlines, and thus the designers again might need to make decisions (Cooper et al. 2014: 28).

4.4 Fogg's design process

Fogg (2009) has created a process for the development of persuasive products. It consists of 6 steps summarized below.

- **Step 1: Choose a simple behavior to target** - It is often better to start with a small goal that is a first step towards a more ambitious goal. For example, having water to lunch rather than a soda might improve the user's health a marginally, but it is a small step towards the more ambitious goal of helping the user to a significantly better health (Fogg 2009b).

- **Step 2: Choose a receptive audience** - Identify a group that is receptive to the targeted behaviour change, and one that is familiar with the technology channel (Fogg 2009b). The designer should not try to design for everyone (ibid.).

- **Step 3: Find out what prevents the target behavior** - Investigate if it is the lack of motivation, ability or something that triggers the user to behave according to the target behaviour (Fogg 2009b). If the user lacks both motivation and ability, Fogg argues that the target behaviour or audience might need to be redefined (ibid).

- **Step 4: Choose a familiar technology channel** - Select the technology that is best suited for the target behaviour, and that the audience is familiar with (Fogg 2009b).

- **Step 5: Find relevant examples of persuasive technology** - Fogg suggests that the team finds at least 9 examples of similar products: three that have a similar behaviour, three that have the same audience and three that uses the same technology channel (Fogg 2009b).

- **Step 6: Imitate successful examples** - According to Fogg, Identifying and adapting successful examples of persuasive design is a fast way of making progress on the product (Fogg 2009b). Identifying what actually makes the product work to persuade people is required, not only to imitate the solution (ibid.).

- **Step 7: Test and iterate quickly** - Many quick experiments give more insight than few larger ones (Fogg 2009b). Different design options are evaluated based on people response, ideally by measuring if their behaviour's change (ibid.). Step 6 and 7 should be iterated until the design succeeds in changing the target behaviour at a small scale (ibid.).

- **Step 8: Expand on success** - Fogg argues that everything big started small,

and that incremental enhancement to a design from step 7 that likely succeeds in changing the target behaviour is a good starting point for the product to expand (Fogg 2009b).

4.5 Design methods

This section contains different design methods, grouped by the phase in which we think that they could be useful.

4.5.1 Research methods

In this section, methods that we believe could be useful when researching the domain and the potential users are described. It also describes how to construct *personas*, a tool to aggregate data collected from user research into fictional persons that can be used as a target audience for the design.

4.5.1.1 Interviews

Interviews are a type of research that questions a subject with questions that are either predefined (structured interview), or not (unstructured) (Martin 2012). Unstructured interviews can be beneficial during the exploratory phase, when the direction that the conversation will take is less certain (ibid.). The questions should be asked in person so that the interviewer can draw additional knowledge from the subjects facial expressions and body language (ibid.).

4.5.1.2 Contextual inquiry

Beyer and Holtzblatt (1998:1-78) invented the so called *Contextual Inquiry*, which is an ethnographic interviewing technique based on a *master-apprentice model*. According to Beyer and Holtzblatt (1998:1-78) the idea is for the interviewer to act as an apprentice, asking questions and observing the user, as if they were a master craftsman.

Cooper et al. (2014:45) have made some improvements from the original *Contextual Inquiry* model. They state that it can be effective to limit the interviews to one hour long and do about six interviews with different users. They also state that it can be effective to conduct the interviews sequentially, having all designers participate in them, as opposed to doing many in parallel with different designers in each. This approach fits us perfectly since we are (only) two designers.

During the interviews, the designer should, according to Cooper et al. (2014:44), interact with and observe the user in their normal work environment, as opposed to a lab setting. The context of this natural setting, which includes all artifacts the user uses, will bring out important details about the behaviour that might be missed otherwise (ibid.).

The designer should gather facts from the Contextual Inquiry, while at the same time, objectively, read between the lines to find out behaviours that are not said or done explicitly by the user (Cooper et al. 2014:44). We interpret from Cooper et al.'s description that the interview held with the user should be semi-structured, free enough to adjust to the user's answers and their context, but strict enough to subtly direct the interview in order to capture the design issues that are relevant.

Cooper et al. also suggest that user goals should be identified and prioritized rather than tasks.

4.5.1.3 Observations

Observations can be used to gather context, tasks and goals of users (Rogers 2013:247). An observation can be done in a controlled environment where the user performs specific tasks in a usability lab or similar, or in the field where the user is observed as he/she performs day-to-day tasks in the natural environment (ibid.).

4.5.1.4 Personas

According to (Cooper et al. 2014:61-62) an effective way to make use of all data acquired from the previous research steps, is to create descriptive models. These models are known as *personas.*

The process for creating personas includes grouping the interview subject's data by the role at their company (Cooper et al. 2014:82-85). Within each group the distinct aspects of behaviours (behavioural variables) should be listed (ibid.). Then all interview subjects are mapped to these behavioural variables in order to find if there are clusters of interview subjects with similar values in many behaviours (ibid.). Each found clusters might represent a behaviour pattern which then should be used to synthesize and map details from the research data into what will become a persona (ibid.). The behaviour patterns will thereby lead to one persona each.

The next step involves finding eventual gaps in the personas which then could be solved by more user research (Cooper et al. 2014:87). At the same time redundancies should be identified, for example if two personas are too similar, one of them could be removed (ibid.).

At this point the personas should be prioritized and divided into types as *primary,* *secondary,* *supplemental,* *customer,* *served* and *negative personas* (Cooper et al. 2014:88-90). When this is done, the last step is to expand the personas' descriptions, such as adding narrative and photo (ibid.).

Another important persona aspect brought up by Cooper et al. (2014:97), is the *provisional persona.* A provisional persona is one that is created despite having insufficient data for a real persona. The provisional persona is based on the available data and best guesses about the domain and can, even though being limited, be a

useful tool for communication and focus in the design process.

4.5.2 Ideation methods

The methods here are focused around the process of forming ideas and can be used in the *Modelling*, *Requirements Definition* and *Design Framework* processes of the Goal Directed Design model and the *Designing Alternatives* of Rogers's iterative model.

4.5.2.1 Scenarios

A scenario is a story that describes how a product meets its user's goals by formulating a narrative of how the user interacts with it (Cooper et al. 2014:102). A good way of capturing real user's goals is to design the scenarios around personas, called persona-based scenarios (ibid.). Before any sketching is done *context scenarios* are created, that describes an ideal user experience, without digging into too much detail (Cooper et al. 2014:106). Later in the process a context scenario can be transformed into a *key path scenario*, adding details about how the user interacts with the product (ibid.).

4.5.2.2 Brainstorming

Brainstorming can be used to generate early ideas or to discover solutions to problems later on in a design process (Kelly and Littman 2000). A brainstorming session should last about an hour, and have a clear problem statement formulated before it is started. A good problem statement has its focus towards a customer need, rather than some organizational goal (ibid.). It is also important not to criticize ideas, to generate a large quantity of ideas, and try to jump between new design spaces (ibid.).

4.5.2.3 KJ method

KJ method is a way of sorting the ideas or thoughts within a group collaboratively (Scupin 1997). The ideas are written on paper cards and then sorted collaboratively by the group, using intuition to as a basis of the grouping. The method, named after the Japanese scientist Jiro Kawakita, helps groups understand the information and knowledge that the group has access to better, and can make the group draw much better conclusions (Spool 2004).

4.5.3 Prototyping methods

A prototype is necessary in order to interact with a design. For this reason prototyping methods can be used. In the earlier prototyping iterations the methods can be more low-fidelity oriented such as *Sketching* and in the later iterations they can

be more high-fidelity oriented such as *Digital Prototyping.*

4.5.3.1 Sketching

Sketching requires only very simple tools: a pen and paper (Gedenryd 1998). The process of sketching helps the designer develop ideas, experiment with alternatives and figure out how the final solution should look (ibid.). The focus when sketching should not be to develop a polished product, but to learn and develop the solution (ibid.).

4.5.3.2 Digital Prototyping

To create high-fidelity prototypes, digital tools such as Adobe Experience design or Sketch can be used (Adobe 2017; Sketch 2017). These tools can simulate a working application by creating graphics that represent different areas of the application, and even make them interactive by binding events such as mouse-press and hover to different actions (Adobe 2017). This section describes Adobe Experience Design as well as Material design, which is a visual language that describes many useful rules and patterns to use when designing, and that was used within Adobe Experience Design.

Adobe Experience Design

Adobe Experience CC design is a tool for designing interactive prototypes (Adobe 2017). The tool is currently in beta, but works well, apart from a few missing features that some of the competitors offer, such as shared styles for many similar elements. It does however already offer some features that the competition in many cases does not. For example, one can create interactivity, like linking two screens together by clicking on an element, right in the program (ibid.). Usually, with these types of tools, the designer needs to export images from one tool and then import them into a tool specifically for interactivity. In Adobe Experience Design it is also possible to publish the design on a web-site with just one click, so that others in the team can view and comment on the design (ibid.).

Material design

Material design is a system, created by Google, that tries to combine classical principles of good design in the physical world with possibilities from modern technology (Google 2017b). Google refers to Material design as a visual language, that defines rules for details such as margins and font-sizes as well as navigation and information hierarchy (ibid.). For projects where it is not feasible to spend a lot of time designing common UI-elements and rules, we believe that a visual language can let the designers focus on the more important interaction aspects like the overall behaviour.

4.5.4 Evaluation methods

The methods in this phase can be used to evaluate ideas and prototypes, usually during the end of a design iteration.

4.5.4.1 Think-Aloud

Rogers (2013:247) states that observational methods can be useful in the evaluation stage to investigate how well the designed prototype supports tasks and goals. *Think-aloud* is one such method where the designer asks the user to use the system while verbalizing the thoughts that they have(Nielsen 2012). The user should be given a set of representational tasks and perform them while talking about how they are thinking when interacting with it(ibid.). The technique is useful since the designer not only can see what the user is doing, but also get a understanding of what is going on in the user's head (Rogers 2013:256). Jakob Nielsen goes as far as saying that it might be the most valuable usability engineering method, as it is cheap, easy an can be applied prototypes in any stage (Nielsen 2012).

4.5.4.2 Heuristic evaluation

Heuristic evaluation is a method to find usability problems in an interface (Nielsen and Molich 1990). To conduct a heuristic evaluation, the problems with the interface is identified based on some *heuristics* that the interface should fulfill, such as "Minimize user memory load" or "Provide clearly marked exits" (Nielsen and Molich 1990). Typically, each evaluator does not find a majority of the problems, but if several people conduct the evaluation independently, a lot of errors can be found (Nielsen and Molich 1990). Nielsen has defined a set of well-used heuristics based on his research. It is possible to define custom heuristics, but the ten original heuristics by Nielsen (1995) are:

1. Visibility of system status

   - The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

2. Match between system and the real world

   - The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

3. User control and freedom

   - Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

4. Consistency and standards

- Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

5. Error prevention

- Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.

6. Recognition rather than recall

- Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

7. Flexibility and efficiency of use

- Accelerators – unseen by the novice user – may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

8. Aesthetic and minimalist design

- Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

9. Help users recognize, diagnose, and recover from errors

- Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

10. Help and documentation

- Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

4.6 Programming tools

In this section two modern web technologies are presented; Typescript, a programming language that compiles to Javascript, and Angular, a framework that itself is

built using Typescript (TypeScript 2017; Google 2017a).

4.6.1 Typescript

Typescript is an open source language developed by Microsoft (TypeScript 2017) (Microsoft 2017). The language is a superset of Javascript, which means that any typescript-file is also a valid Javascript (Syed 2017). Typescript compiles down to Javascript, and has two big advantages over standard Javascript:

- A type system, that helps developers write code that is easier to maintain and refactor (Microsoft 2017).

- The latest version of Javascript's features normally do not run on the majority of web browsers, but since Typscript compiles down to older versions of Javascript, developers can use the new features of the language while still maintaining compatibility on most browsers (TypeScript 2017).

4.6.2 Angular

Angular is a Javascript framework created by Google (Eisenberg 2017). With Angular, it is possible to create applications for all major platforms, such as for mobile, web and desktop (Google 2017a). Applications in Angular are created using web components, encapsulated interface components, that makes reusing and sharing code easy (ibid.).

5

Planning

This chapter describes how the research will be structured, following a design process that takes most of its parts from the Goal directed design process as described by Cooper et al. (2014) but in an iterative manner, as described by Rogers (2013). Each iteration will consist of the six steps described by Cooper, but rather than *Support* in the sixth step we will do evaluation of the design and gain knowledge for the next iteration, as seen in Figure 5.1. To make the process more graspable, and giving ourselves more freedom and creativity than Cooper's strict and detailed steps allow, the six steps are divided into four steps, as seen in Figure 5.1 and described in 5.1-5.4. We will divide the work into three iterations of one month each, as seen in Figure 5.2.

Before the first iteration starts there will be a preliminary study, consisting of a comprehensive literature review, researching the ideas and methods that exists within the field of persuasive design, persuasive design within sustainability and behaviour science. Some technical research will also be conducted, mainly about web development such as Angular and Typescript.
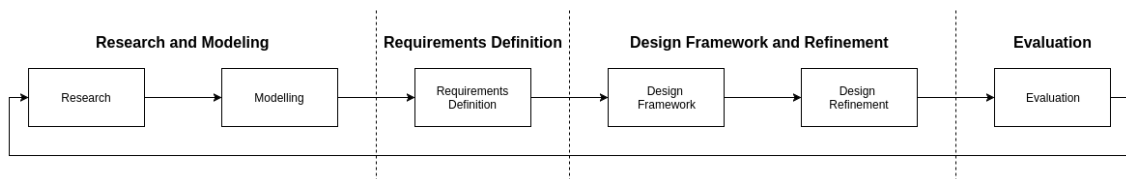
Figure 5.1: Cooper's Goal-Directed Design process applied to iterations as in Roger's Iterative Design approach. The six steps are divided into four steps described in 5.1-5.4.

5.1 Research and Modelling

The research phase will involve user research, however, we do not specify the exact methods that should be used. We view the methods described in 4.5.1 as a toolbox of methods that can be be used depending on the current needs. It is also hard to

predict which users and companies that will be available at each sprint.

Qualitative methods (as described in 4.3) such as interviews, think-aloud and contextual inquiry will be used during the research. We will try to find out what is missing to reach the target behaviour; as described in 4.4, this could be the users motivation, ability or a trigger to perform the desired action. We will reach out to companies and subject matter experts to conduct interviews in order to gain knowledge about their work and behaviour. Specifically the first exploratory research will involve investigating the users *ability* to act more sustainably. In organizations, we view this as an important factor, as rules and decision processes are very prominent here. If the users of the system *can't* change the actions of the company, getting cues to do so will probably be annoying rather than motivating.

Personas will also be created based on the knowledge collected from the research, which will help guide the design further into the process.

5.2 Requirements Definition

Requirements definitions will consist of brainstorming to come up with different alternatives to change the persona's behaviour. The brainstorm will use the persuasive design strategies as described in 3.3 as starting point, to see how they can be used in our design. As stated in 4.4, we will try to find examples of successful products that persuade the same target behaviour as we have identified, and imitate these if possible.

5.3 Design framework and refinement

Prototypes will be created by sketching and with digital prototyping. Sketching will be used to develop design the interaction framework, while digital prototypes can be used to better test the interaction with users, and to created a refined design. Ideas that we find promising will be implemented to Narrative's' existing web platform.

5.4 Evaluation

Based on the theory we gather in the literature review, we will formulate a number of heuristics. The heuristics will be used to perform heuristics reviews (as described in 4.5.4.2) throughout the project. The heuristics should relate to how well the design persuades the user, based on the theory that we have collected.
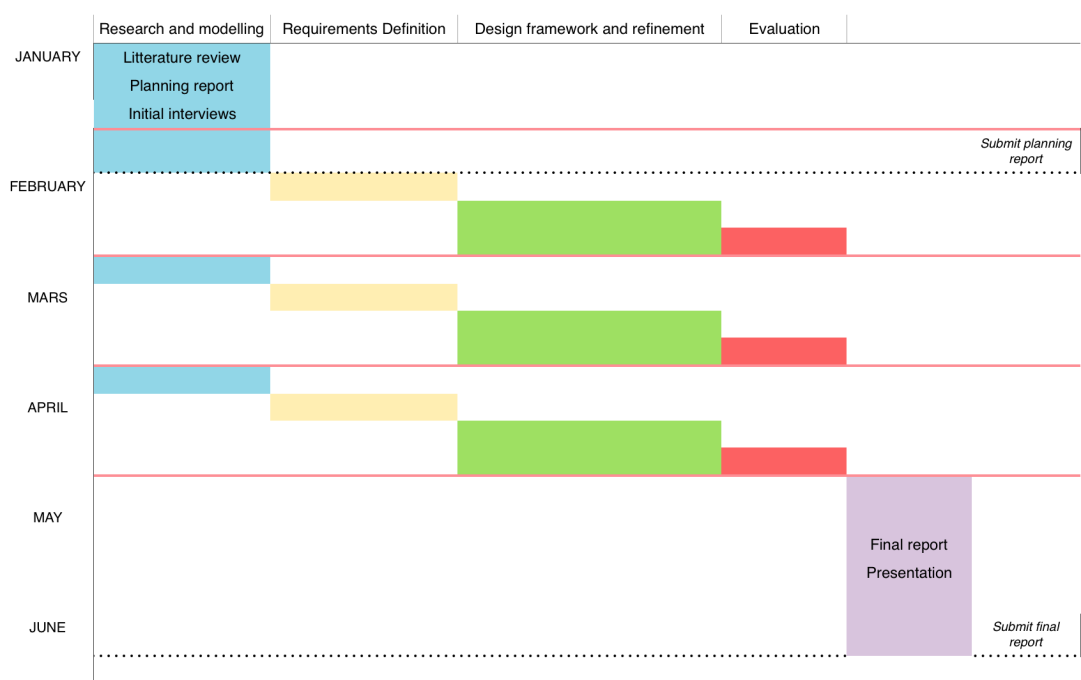
Figure 5.2: The time plan for the project.

6

Process

The process was divided into several parts, each described in chapter 5. The first part was the Preliminary Study, which included researching the theory, methodology and planning covered in chapters 3-5.

After the preliminary study two design iterations followed, where we investigated the design space by creating a prototype. Since we realized that there would not be enough time to implement features within our design iterations, we decided to limit this to two iterations, rather than the three we had planned for. This allowed us to conduct an implementation phase where we developed a functional prototype for a sub-set of the features that we had designed.

The work can be described at an abstract level in Figure 6.1. This was a model that we developed during the process, to better understand the way we structured our work. User research guides the creation of personas, while the theory research guides the creation of heuristics. Both of these are then used to define requirements for a new design. The existing Normative product also contributes with requirements, as the new prototype should at least be as functional as the existing one.

6.1 Preliminary Study

During the preliminary study we researched areas such as persuasive technology, environmental issues and design methodologies. We also made a preliminary plan for our research. In addition, interviews with the employees at Normative were conducted to understand their current platform and their vision of the future.

6.1.1 Literature review

The first activity in our preliminary study was a literature review. The topics that we researched were several different concepts that related to persuasive technology, sustainable development and how companies work with questions regarding sustainability. These were all concepts that we needed to understand for this project. We started off by listing all of the areas that could be useful for us to read about. The main subjects that we looked for was:
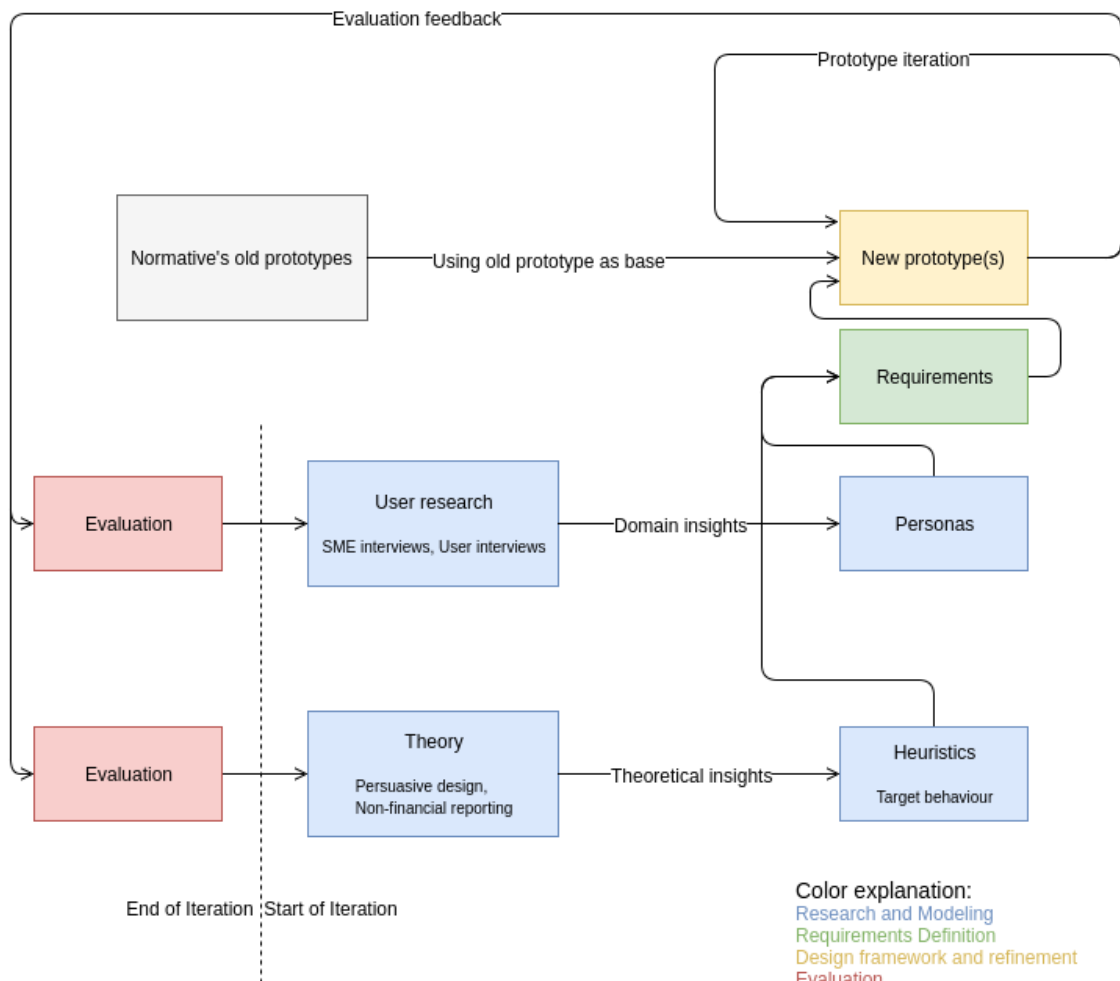
Figure 6.1: The flow between the different parts of the design iteration process.

- Persuasive technology

- Environmental issues

- Environmental psychology

- Non-financial reporting

- Motivation

- Behaviourism

We had some idea about what topics that seemed useful when the thesis started. Some of the topics also came up while reading about other topics, and some were recommended by our supervisor. We also reached out to an environmental psychology expert at Gothenburg University who recommended valuable related work. Our main source of articles was ACM Digital Library (2017) and our main source of books was Chalmer's School Library.

6.1.2 Stakeholder interviews

Several months before the thesis started we had our first interview with the co-founder of Normative, Kristian Rönn. The concept and goal of Normative is quite complex, and it took some time for us to understand the company's goal. One important aspect for us to understand was whether or not they are interested in helping the companies that use the product to become more sustainable, or if they just want them to use the automated reporting to reduce the manual work it takes for companies to create their sustainability reports. Kristian made it very clear that the automated reporting tool is a way to sell the product, but that the end goal is to create a platform that helps companies become more sustainable.

Kristian explained how Normative measures the sustainability of companies by connecting to their bank or accounting software and from which the system collects data about all the purchases that the company makes. This data is then mapped to product categories in a product system called UNSPCS. For example, a piece of chocolate would be mapped to the UNSPCS-category "Chocolate or chocolate substitute". Normative has a large database of data about the sustainability impact of all of these categories, which then help the system calculate the total impact for the company.

If the purchase data that comes from the accounting software does not contain information that is enough for Normative to know what sort of product it is, it uses a machine learning algorithm to guess what type of product it is. The algorithm has been thought to make good guesses about what a transaction with a certain label usually contains. The user can then choose to correct that algorithm or decided that the guess is good enough and use it. This has the implication that in many cases the user can choose to put more effort into categorizing the data, and as a

result get better sustainability data. The alternative to that is to let the system guess a lot with less input data, saving working hours at the expense of more precise quantitative output data.

The sustainability data that is used to calculate the companies sustainability indicators(for example climate change or effect on biodiversity, described in 1.1) comes from a collection of so-called life cycle assessment, which is an assessment of the product's impact during its entire life-span (GDRC 2017). For each product category, there is a factor for each of the indicators. If the product category does not contribute to that indicator, the factor is 0, and for indicators that the product category do contribute to, the factors is higher.

The interview with Kristian gave us knowledge about how Normative works, and the goal that he had for the product. This knowledge that was then used during the design iterations to improve their product.

6.1.3 Review of Normative's current platform

In order to get a better understanding of how Normative's product can be improved further, we reviewed their current platform. The CEO of Normative showed us the different features of the software. The main concept of the product are:

- **Transactions** - Data about a purchase that is imported from the company's accounting software. The data contains information about the cost and date, but which specific products that were bought is not always available. Therefore Normative uses machine learning to guess which products a transaction contains. The user then needs to go through the transactions and verify that the products are correct. Only verified transactions counts when the sustainability indicators or measured.

- **Sustainability indicator** - A metric, such as impact on climate change or biodiversity, based on Normative's definition of sustainability, described in 1.1

- **Supplier** - A data object that describes a company that provided the products in a transaction. This can be added to each transaction so that Normative can produce more types of reports, based on for example geographical location of the purchase, as each supplier has an address.

The main features in the platform are:

- **Transaction** - A view where all of the transactions can be managed. This is where the user goes through the data that is imported into the software, and verifies that it is correct. This is called **Accounting** in the newer prototypes that Normative has developed. The feature can be seen in figure Figure 6.2.

- **Reports** - A view where the user can see graphs of all the indicators that Normative measures.

- **Suppliers** - A view where the user can manage the suppliers.
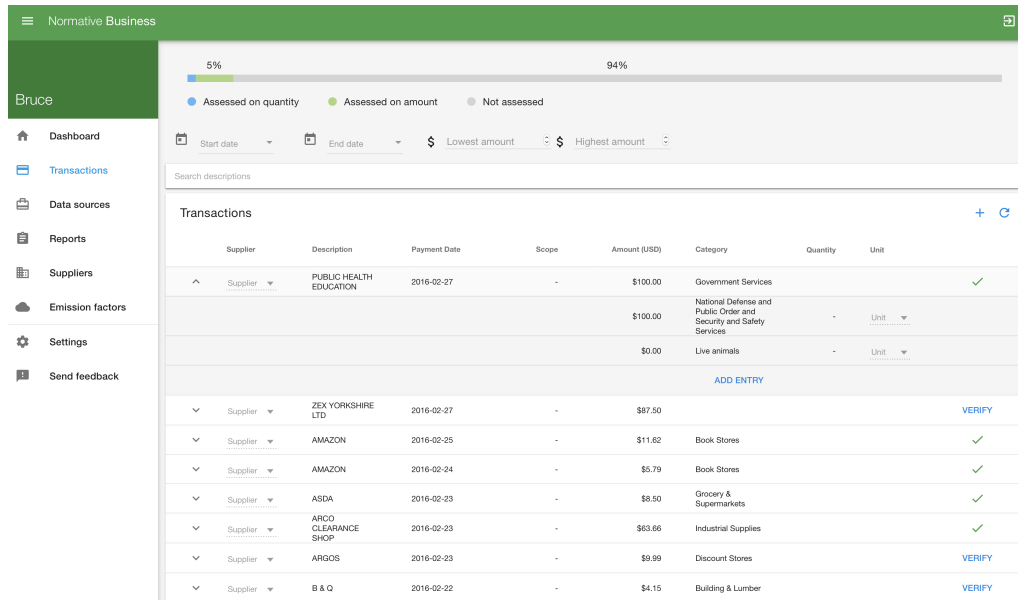
Figure 6.2: Normative's current platform.

6.2 Design Iteration I

The goal of the first design iteration was to get a necessary understanding of the domain and the potential users. Since we were still very unfamiliar with the domain and its users, it was not possible to create fully developed personas and scenarios in this iteration. The work consisted of conducting user interviews, defining a target behaviour, creating provisional personas and finally creating designs for the personas which then were to be evaluated.

6.2.1 Research and Modelling

The first step in our design iterations was called *Research and Modelling*, where we researched the potential users, and used the research data to model personas, described in detail in 5.1. For the first iteration, this included a trip to Lund to interview key individuals at companies and the creation of provisional personas to summarize the interviews. We also chose to include a heuristic evaluation of the current Normative platform in this phase.

6.2.1.1 Defining a target behaviour

As a first step in the design process for persuasive products defined by Fogg, mentioned in 4.4, a target behaviour should be designed. As previously noted, the tar-

get behaviour is useful during the design process, to know exactly what the desired change in user behaviour is.

There are several ways to try to make a company more sustainable. The Normative application itself is however limited to choices regarding purchases. For this reason we made our first suggestion centred around company employees simply making more sustainable choices:

When the user makes decisions, they choose the more sustainable option, whenever feasible.

This behaviour is useful in that it clearly makes the company act more sustainable, however, it is very ambitious and hard to measure. Instead, we came up with a smaller, more manageable behaviour, that could later on be extended:

When the user decides between two products to purchase, they choose to purchase the more sustainable option more frequently than when not using the application.

We consider both of these target behaviours useful. The second one is easier to measure and less ambitious than the first, and as Fogg (2009) states, this is a good first step. We also believed that a more ambitious target behaviour was worth keeping in mind, as it could guide the design in future iterations.

6.2.1.2 Heuristic Evaluation

After deciding what our target behaviour was, a set of heuristics were defined. All of the heuristics were chosen to help or encourage the user to make the more sustainable decisions, thus they were based with our target behaviour in mind.

We believe that following some well-known UI-principles would not only make our interface more usable, it could potentially also make it more persuasive. Some of the heuristics were therefore based on Nielsen's heuristics, mentioned in section 4.5.4.2, while the first three were based on what we believed was needed to reach the target behaviour. The ten heuristics were:

- **Shows the difference between the products that are sustainable and those that are not.** - This directly relates to the user's *ability* to act more sustainable. If the user is unable to distinguish the sustainable option from the unsustainable, they will not be able to act more sustainably.

- **The interface provides a clear overview of the company's environmental impact (to those that have the power to change the company's action).** - This relates to the self-monitoring strategy described in 3.3.2.5. As mentioned in 3.3.2.5, if a user, specifically the user who has the ability to change the company's behaviour can monitor the impact in real time, it is easier to achieve goals and improve.

36

- **The interface gives feedback on the decisions that the company makes.** - As mentioned in 3.3.2.6, surveillance is a strategy to persuade. The feeling of being monitored and judged can help the user become more sustainable, thus they should be given feedback when reporting their behaviour.

The following heuristics are defined by Nielsen, but we believe that the reduced cognitive load is a way to use the reduction strategy as described in 3.3.2.1 to achieve the target behaviour.

- **Match between system and the real world** - The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

- **Consistency and standards** - Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

- **Recognition rather than recall** - Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

- **Flexibility and efficiency of use** - Accelerators – unseen by the novice user – may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

- **Aesthetic and minimalist design** - Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

- **Help users recognize, diagnose, and recover from errors** Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

Evaluations using the heuristics

Five heuristic evaluations were conducted on Normative's current platform with students at Chalmers University of Technology, within the interaction design program, including the authors of this thesis. The evaluators were given access to a computer with the Normative application, and were given a brief introduction to the product. After that they were told to look for errors violating the heuristics that were defined. The evaluations took about one hour each.

We also conducted the same evaluations on a newer low-fi prototype that Kristian,

the CEO of Normative, had made. For this evaluations we were the only evaluators. This alongside with a discussion with the Normative-team about the new features in that prototype gave us a better understanding of what the company aimed for in terms of future features.

Outcomes of Heuristic Evaluation

The evaluation generated a total of 87 errors. Since the evaluators were not experienced in doing non-financial reporting, some of the errors were not actual errors but rather things that they did not fully understand. Still many more useful errors were found than when only the authors conducted the evaluation. The participants had different perspectives, one had a very critical view of the look-and-feel of the application, and one was more focused on the flow of things, being frustrated that the application did not explain things better. Some particularly useful findings were:

- The lack of possibility to view and compare the sustainability between transactions and products.

- The difficulty to see how the data affects the graphs in the reports.

- Lots of usability related errors.

- One evaluator checked to see if standard controls such as tabbing between components and copy-and-paste worked. Tabbing did not fully work in a predicable way. Tabbing, acting as an accelerator, is a useful way to use *reduction*, mentioned in 3.3.2.1, which makes this an important finding.

The result from the heuristic review does not provide any knowledge about how real users experience the application, but rather how well the system implements best-practices and how well it persuade people based on the theory we have collected. The result gave us many ideas about how to start our design. We used the results from the heuristics later in the process, when designing new prototypes.

6.2.1.3 Interviews

When visiting Normative's offices in Lund and Malmö we conducted three interviews. Since this was the first project iteration we decided to keep the interviews semi-structured with the same general interview guide found in Appendix A for all three. This meant that each interview could be adapted as we went on, and customized according to what the interviewee said.

The purpose of these interviews was mainly to get a better understanding of how companies work with sustainability and non-financial reporting. One key area that we wanted to find out was what sort of power the person who would potentially use the software has. This is crucial and ties to the *ability*, one of the three ways of persuasion mentioned in 3.3.1. In other words: we needed to find out what possibilities the user would have to make changes at their companies.

Outcomes of the interviews

Two of the companies, a communication bureau and company working with recycling of soda cans, are small (2-3 employees). The third one is a big, multinational company. When interviewing the the two founders of the communication bureau we realized how little time such small companies have to base their purchases on environmental calculations. They were also an example of two entrepreneurs that put their ethical values over the pursuit for profit. Their office was in their shared apartment and they took courses at the university while running their small business. They did not want to work with any company with which they did not approve ethically of.

All three companies have sustainability as a large part of their public profile, and the owner of the company that works with soda cans emphasized the fact that even though his company did not have a lot of big purchases, it was important for him to run the company in a sustainable way so that the company would seem credible.

At the energy company we interviewed their head of sustainability(CSO). She had previously worked with sustainability reporting, and was the only user with experience in this field, that we managed to reach. We realized the huge difference between a company of this size, compared to the smaller ones. The company had several divisions that performed environmental calculations, which is part of what Normative's product attempts to automate. The CSO also emphasized that users working at her position usually have a lot of motivation to push their companies to become more sustainable, and what was missing rather seemed to be tools to convince others at the company.

Another interesting finding from the interview with the energy company was that they, in sustainability reports, also were interested in including human values, such as corruption and conditions in the workplace, in addition to environmental impact.

The interviews ended with a short demonstration of Normative's current product, were the interview subjects were asked to give feedback. The feedback here differed a between the different users: the CSO wanted more features and metrics, while the founders of the small communication bureau wanted less information and more automated and simple tools.

The results from the interviews were used to create the provisional personas, and to improve our understanding of the domain and the potential users.

6.2.1.4 Creation of provisional personas

The insights from the interviews were used to create two provisional personas. The intention was to make the design process less abstract by focusing on vivid personas instead of using the rigid data as requirements. However, at this point we did not have enough data to create complete personas. We therefore decided to revisit this step in the next design iteration when more interviews had been conducted. At this

stage however, we created provisional personas (as mentioned in 4.5.1.4), using the data that we had and trying to fill in the missing gaps of details necessary for a believable persona. This way we could still benefit from the persona narrative by having a direction to work in, in the wait of the real persona creation in the second iteration. Both of the created provisional personas are found in Appendix B.

6.2.2 Requirements Definition

When we had a set of provisional personas, we could start the requirement definition process. In this early iteration however we reckoned that it was important to focus on the overall goals such as the problem and vision statement and also brainstorming on how Fogg's strategies could be used. No formal scenarios were created but keeping in mind how our provisional personas would act in certain situations was still a useful tool since it could guide our design and the brainstorm.

6.2.2.1 Problem and vision statement

The first step of identifying the scenarios, that were going to be used in the next iteration, was to to create a problem and vision statement. This had already been somewhat answered previously by defining the target behaviour and the heuristics. To clarify further, we formulated a problem statement as:

Normative's platform does not persuade the user into making more sustainable decisions on behalf of its company.

The obvious vision statement that solves this problem is to simply make the design more persuasive. However, stating only that the design should be more persuasive leaves a lot of questions. How should the products persuade? What should it persuade the user to do?

Our heuristics, defined in 4.5.4.2 provide a more concrete set of requirement for what we believe it needed to persuade the user to make more sustainable decisions on behalf of its company. The vision was therefore formulated as:

Create less errors in relation to the heuristics, and thus potentially make the application have a greater effect on the target behaviour, making the company more sustainable.

6.2.2.2 Brainstorming

A brainstorming session was conducted in order to come up with requirements related to Fogg's persuasive technology tools, more precisely finding out how we could implement the different persuasion strategies defined by Fogg, described in 3.3.2.

In order to get general ideas out of our heads before diving into Fogg's more specific strategies, we started with a brainstorm with general ideas about the product.

After that we went over each of the five strategies reduction, tunneling, tailoring, suggestion, self-monitoring and conditioning. Since surveillance was not applicable to the scope of voluntarily using a web application within a company, it was left out.

We spent about ten minutes on each strategy to come up with ideas on how to use that strategy to improve the persuasion of Normative. Even though it was sometimes hard to brainstorm without preconceptions, since there was already a developed product, a lot of thoughts and ideas came out of this process. Most importantly it gave us a chance to finally discuss some ideas that had come up during the user research, but had not been discussed thoroughly at that time since it had not been the focus during the user research phase.

An hour of brainstorming was enough for us to get most of our ideas out. The ideas, which ranged from simple GUI enhancements to completely new features, was written down on post-its and group by the strategy they belonged to.

One important finding regarding reduction was that to make all lists with "virtual scroll", which mean that they can be scrolled down in, even for thousands of elements without lag, rather than changing page the way to old prototype worked. This would make a small but noticeable difference for a user that no longer need to press between pages. One other idea was to have shortcuts to important features in the overview, the view that the user first comes to when logging in.

Findings regarding tunneling were things like ordering the menu items in the order of recommended use, for example Planning -> Accounting -> Reporting, and applying wizards when adding a products to planning which could help compare products and recommend the more sustainable one.

This step resulted in a list of requirements based on the brainstorm and heuristic reviews, combined with the implicit requirements from Normative's already existing prototype, the we worked towards in the upcoming *Design framework and refinement*-step. All findings can be found in Appendix C.

6.2.2.3   Requirements

Due to time limitations, we did not create formal scenarios that could serve as requirements in this iteration. We did however summarize the requirements that we planned to incorporate in the prototype during this iteration. The requirements came from a discussion were the results from the brainstorm, research and the heuristic evaluation were used as a foundation.

General

- A menu that better follows the usage of the platform. The different menu items should be divided into Planning (*before*), Accounting (*during*), Report-

ing (*after*).

- Better use of colors to draw the attention to actions that is considered useful, such as adding data about the transactions, and to verify that they are correct so that they can be used in the sustainability calculations.

Transactions

- A simplified view where the user can view and edit data about purchases.

- Change the wording of "amount" to "cost".

- Less visual clutter, so that attention is focused on the important things.

- Infinite scroll so that the user does not have to click between pages of transactions.

- Make it easier to differentiate between the column-labels of a transaction and the inner view that contain the products that that transaction contains.

Suppliers

- A quick way to add *Suppliers* in the platform.

- A way to bind different "labels" to the suppliers, so that transactions with that description automatically can be marked as coming from that supplier.

6.2.3 Design framework and refinement

Using the requirements from the previous step it was now time to decide the overall framework of the design. The design was prototyped using low-fidelity paper prototype sketches and then into high-fidelity digital prototypes.

6.2.3.1 Prototyping

Based on the requirements we started to implement some ideas that were generated during the brainstorm. The purpose of the prototyping in this iteration was to decrease the number of occasions that the interface has "errors" in regards to the heuristics. Since transactions and suppliers were essential building features of the software we decided to start designing them. The focus for this iteration thereby was features that related to the viewing and verification of transactions and the viewing of the suppliers.

Apart from this we also decided to prototype the overall workflow of the app, thus taking a step back and trying to think different from the current design.
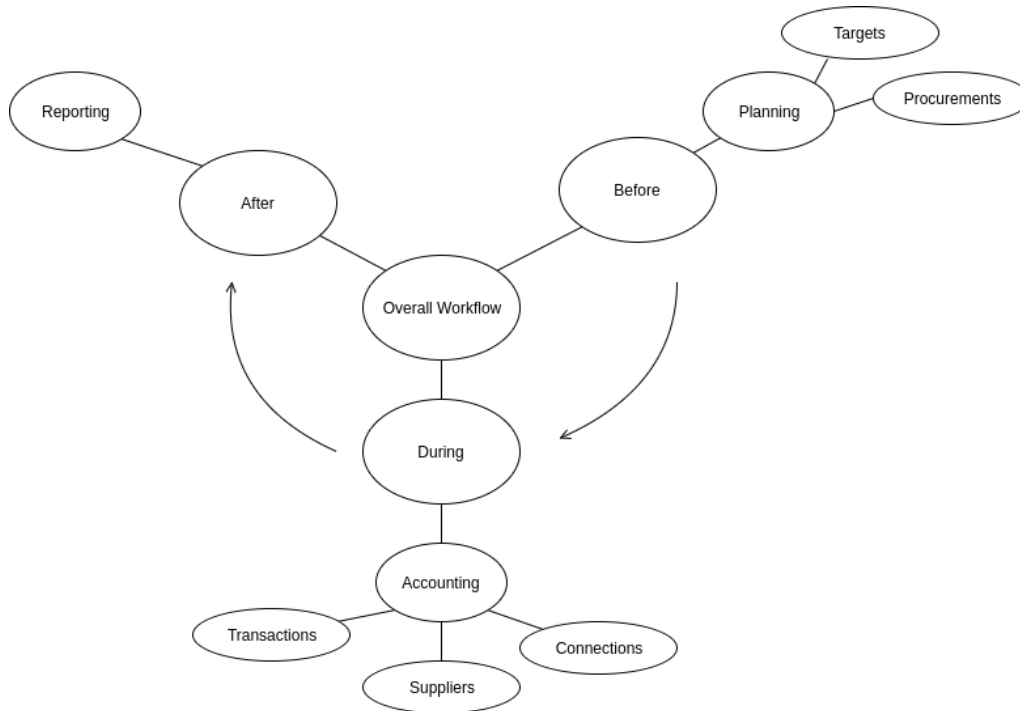
Figure 6.3: The chronological and semantic dividing of the actions.

Overall Workflow

When prototyping the overall workflow we decided to divide the actions of the app chronologically, since it would follow the order in which the user would naturally want to deal with them. The chronological groups were *before*, *during* and *after* a purchase is done, as seen in Figure 6.3. Within each chronological group the actions were also divided semantically into generic groups. In the prototype this was organized in the menu drawer on the left of the screen, as seen in Figure 6.4, where the menu items are ordered chronologically, having the earliest appear on top and the latest at the bottom.

Defining these actions quickly translated into a menu, which was the first thing we decided to design. We decided to stick to the *material design* style (mentioned in 4.5.3.2) that the old prototype also partly had implemented. Since Adobe Experience Design supports the use of material design components we decided to use it for the high fidelity prototyping of the design.

Following the master detail-pattern, each view got its own *paper component* with its header on the upper left. This way the user would know that everything in that paper had to do with the same menu item. Transactions or Suppliers would thereby fill up the main paper element right of the menu.

Another thing discussed was the placement of the logo. We first solved this by
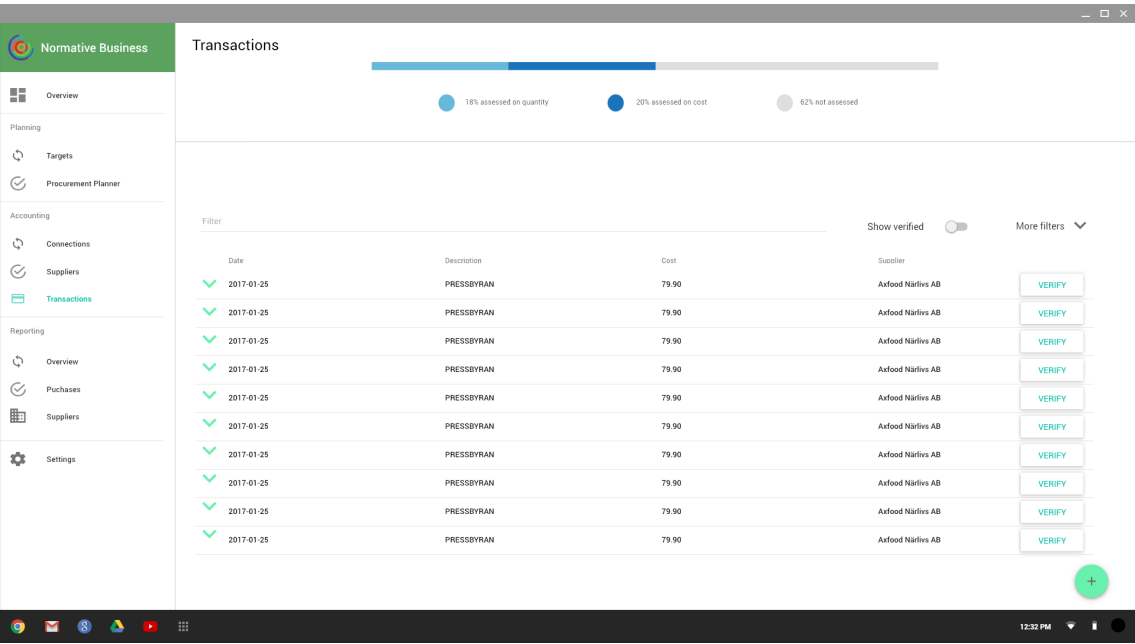
Figure 6.4: The transactions view.

creating a top bar that had the logo to the left and username and log out function to the right. This idea was however discarded in order to save much needed screen real estate. In order to do this we put the logo above the menu, as seen in Figure 6.4. Where to put the username and the log out functionality will be solved in next iteration.

Transactions

When prototyping the transactions view we started with low fidelity hand-drawn sketches (Figure 6.8). This way we could make quick changes and would not get too attached to a nice looking design.

Different solutions for filter were tried (Figure 6.9). To save up space we decided to hide most of the filters by default. The filter section in itself we thought would be self explanatory as being a filter. A header would thereby not be necessary. However the grey text in the text filed saying *Filter* would be an extra clue if necessary (Figure 6.4).

Since the essence of the transaction view is to view and verify transactions we wanted a toggle button for showing/hiding verified transactions, as seen in Figure 6.4. We thought that normally a user would not want to see the verified transactions, but rather having them disappear once verified. However for some use cases, as in making sure a verified transaction had been done correctly, we wanted to give the option to show them. When toggling the button to "show verified" the list would also include already verified transactions, as seen in Figure 6.5.

We made the verified transactions less prominent by making them more grey and by reducing their contrast. This should help differentiate between the verified and unverified transactions. We also wanted to communicate that these transactions should be given less attention than the transactions that still needs to be verified. The texts on the buttons *Verify/Unverify* also signal what actions that can be done on the transactions.
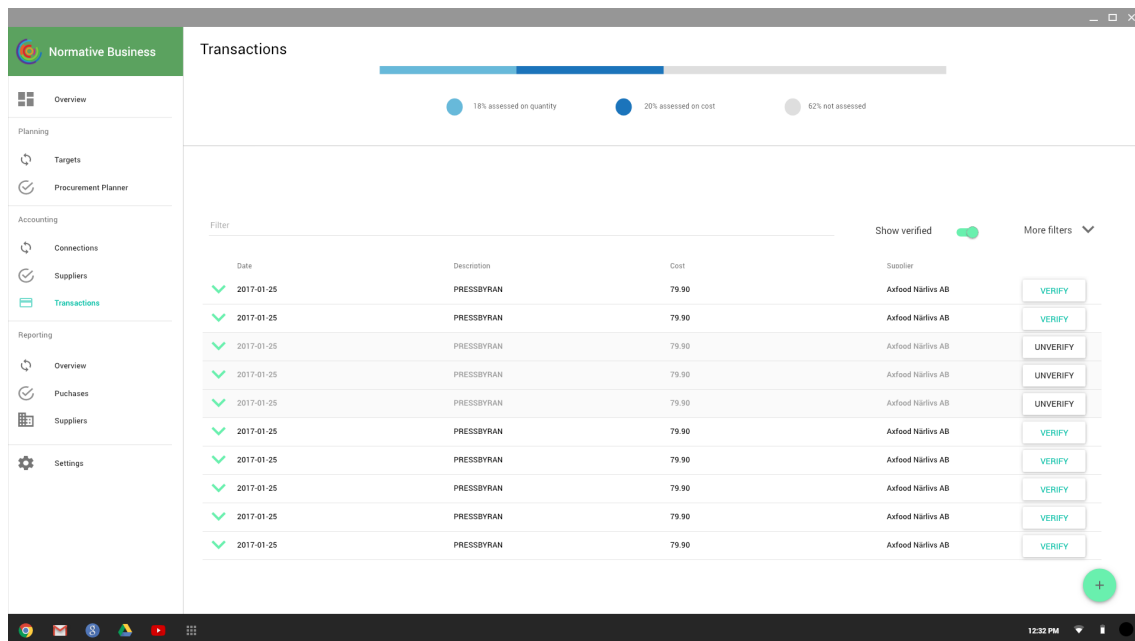
Figure 6.5: The list also shows verified transactions.

Hidden under a *More filters* expanding view are filters for date and cost ranges. (Figure 6.6).

We wanted to keep the the transaction view simple and minimalistic. The transactions could be expanded, edited, deleted and verified (Figure 6.7).

Suppliers

The suppliers are attributes that are added to the transactions for the system to get more data about a transaction. They are generally added manually, with a user creating a supplier, adding attributes to it such as address and what transaction descriptions it is generally associated with. Adding a supplier is a way to tell the platform more about the product, and can help the machine learning algorithm that Normative use to make more qualified guesses about what the transaction contains. It is also used when aggregating statistics about what geographic areas a company buys products from. The design of the Suppliers were made into a list, as seen in Figure 6.11.

Along with this came the view to add a new supplier to that list (Figure 6.10).
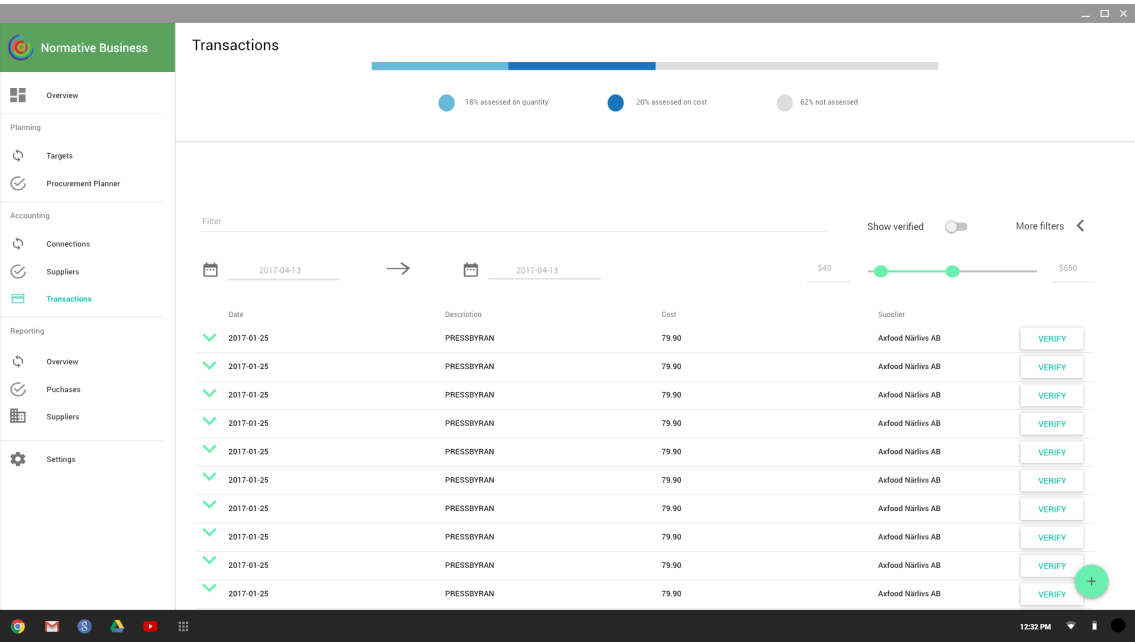
Figure 6.6: Expanded filter in transactions.
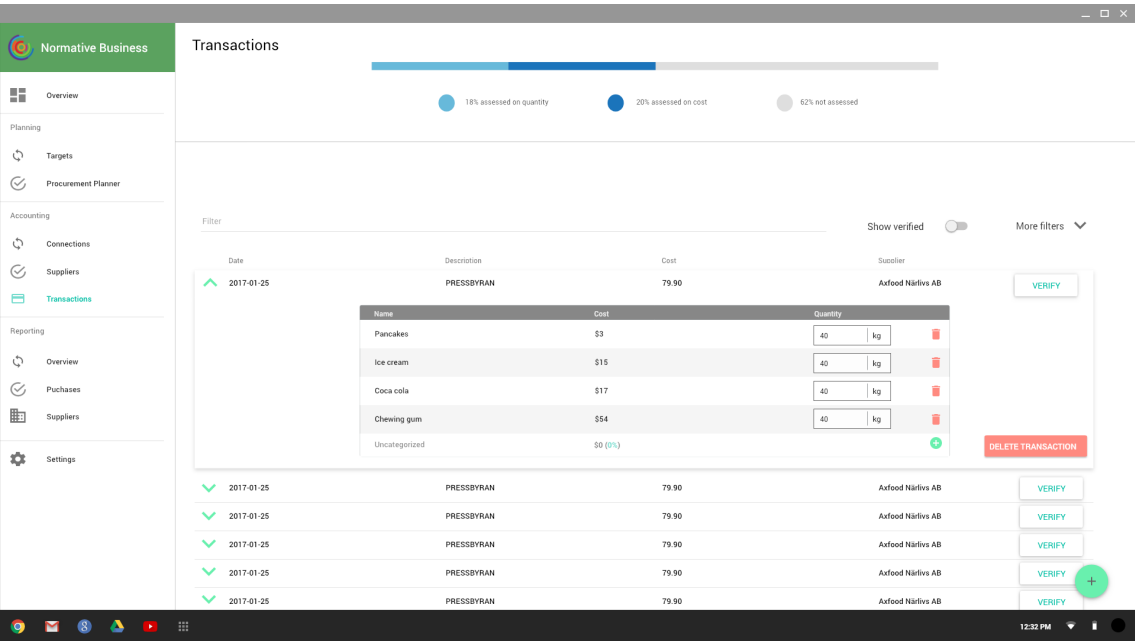
Figure 6.7: One transaction is expanded, showing its entries and editing functionalities.

Color usage

While choosing exact color and style might not appear very important at this stage, we realized that color could be used as a subtle form of tunneling, a persuasive

Figure 6.8: Low fidelity sketches.

strategy mentioned in 3.3.2.2. We identified a green, prominent color that would be used to get people to see it more clearly than less important features, to guide them to become more sustainable. For example, an important step to be able to see the impact that the company has is to categorize and verify the transactions, mentioned in 6.1.2. To hint to the user that this is important, we colored the arrow that expands the transaction green, and the text on the Verify-button, seen in figure 6.5.

6.2.4 Evaluation

The evaluation of the prototype from the first iteration came from two sources: Continuous feedback from Normative each week, and a think-aloud session with a user that had no previous experience with the application. More feedback and testing with potential users would have been useful at this point, but we made the decision that an evaluation of long term persuasive capabilities of the platform would not have been possible to evaluate during a few days. Therefore the feedback that we got from Normative and from the small evaluation session at least gave us a some feedback about the way the domain was understood and the way the platform can be understood by a potential user.
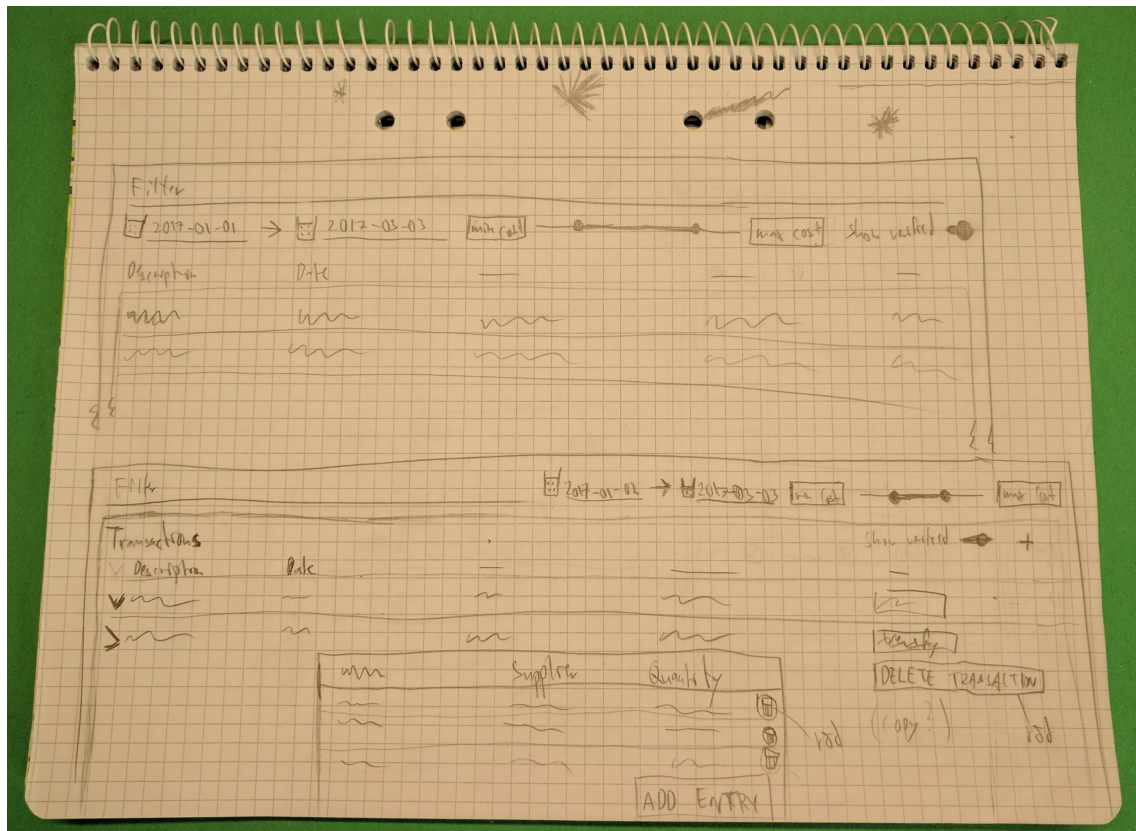
Figure 6.9: Low fidelity sketch of Transactions.

6.2.4.1 Feedback from Normative

After we had created the prototype, we showed it at a meeting with Normative with the purpose of getting feedback on it. This did not give us as much valid feedback as we had hoped, most likely because it can be hard to come up with feedback in such a pressured situation.

Because of that we decided to share the prototype with the employees at Normative online, using Experience Design's (described in 4.5.3.2) share function. With this function we could generate a link, where the users could view and comment on the design in private and in their own pace. After that we walked through the prototype with the stakeholders and discussed the comments together. The feedback given came both from the developers who had worked with the product, and who also have knowledge about interaction design, and also from the CEO of Normative, who has used the tool extensively and knew ways that could speed up his work. For example, the CEO pointed out that a function that would allow him to verify many similar transactions at the same time would greatly help him work faster, something that also was considered earlier in 6.2.2.2.

We continued sharing and getting feedback in a similar fashion throughout the design
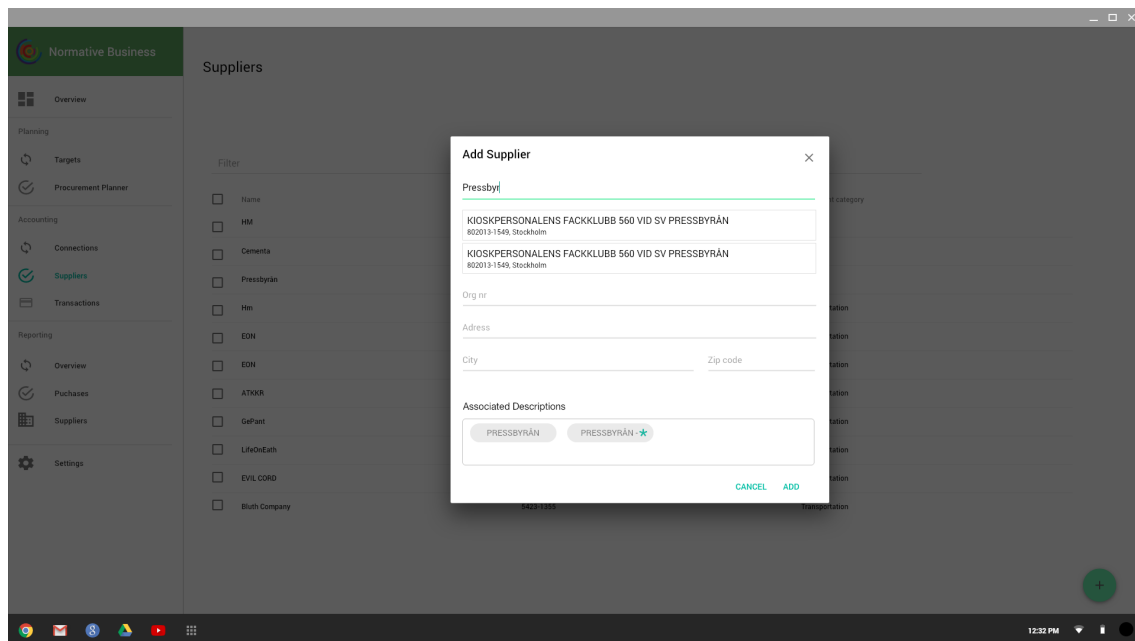
Figure 6.10: Add or edit a supplier.
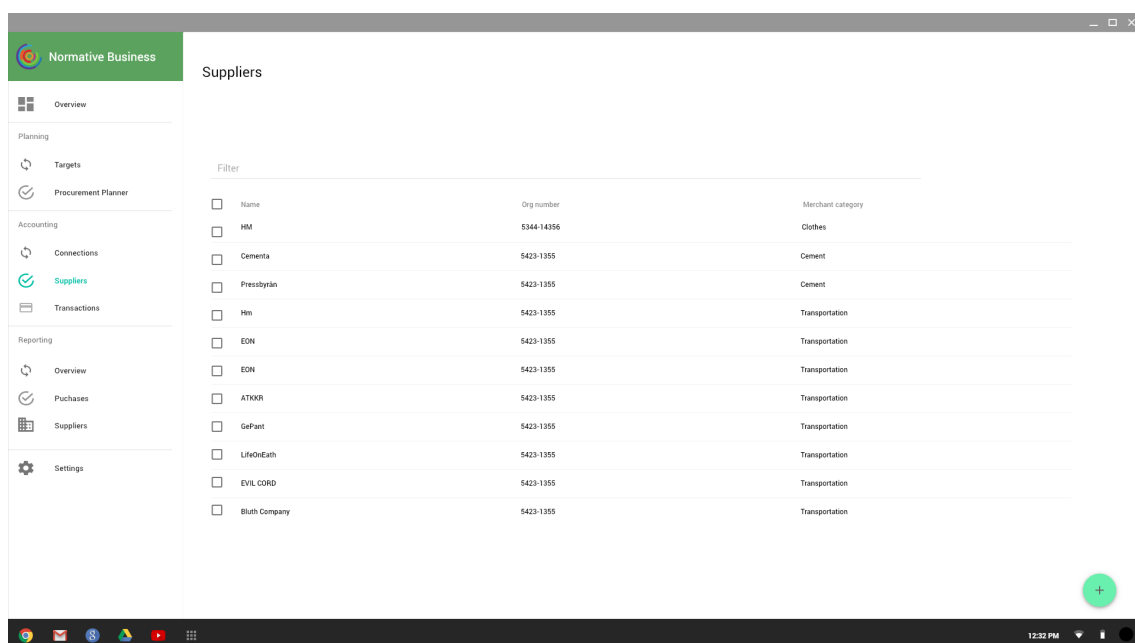
Figure 6.11: Suppliers view.

process.
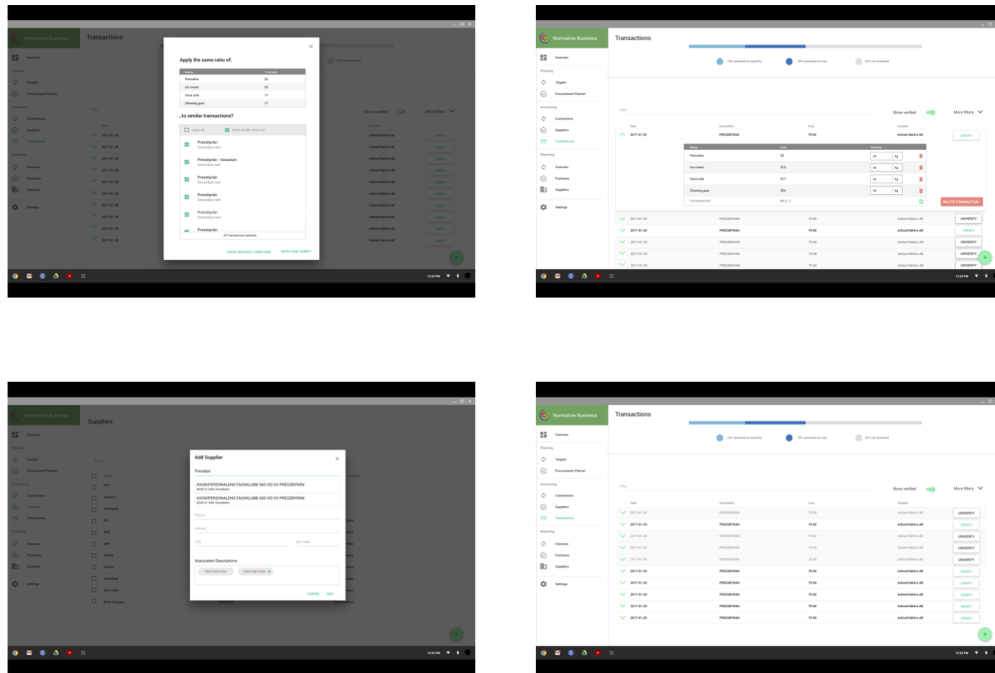
Figure 6.12: High fidelity prototype made with experience design.

6.2.4.2 Think-Aloud

An evaluation was planned using the think-aloud technique (mentioned in 4.5.4.1). Due to time limitation, only one user participated in the evaluation, a friend that did not work with accounting or sustainability, but that was semi-technical, much like our persona Karin, and could test how easy the interface was to understand. The subject had also worked with business tools for purchases and accounting that many of Normative's users also use. A brief explanation was given to the subject about the purpose of the product, and his reasons for using it, namely, that his imaginary company needed to measure its environmental impact, and that he needed to perform some work for the system to understand all the data that was gathered from his bank transactions. He was then given tasks, and was told to explain and point at the screen to how he would solve them. An example of a task is "Show all transactions from 2016 with a cost above $100".

It is important to note here that we did not attempt to test the persuasive capabilities of the prototype in this evaluation. To evaluate this would take too much time, and we would have to find companies that were willing to fully commit to reporting all of their purchases on the platform, which was not our priority at such an early stage. Rather, the evaluation allowed us to test the flow of a typical use case. It

was a quick activity that gave us some interaction details to work on for the next iteration.

Some interesting insights were obtained during the session. It turned out that the text input for filtering transactions was hard to find. The user understood the concept of tagging descriptions for a supplier, but did not understand the that the "*", seen in Figure 6.10, meant a wildcard that could mean any character(s). It also turned out that the user did not intuitively look in the menu when trying to find the Suppliers-section.

6.3 Design Iteration II

The first iteration consisted mostly of user research to understand the domain and to improve the design based on our heuristics. In this iteration it was not yet possible to create fully developed personas and scenarios to build our design for. The second iteration followed Cooper's Goal Directed Design Process as described in 4.3 more closely. We developed better researched personas and with them scenarios that described the best imagined way that our product could help them achieve their goals.

6.3.1 Research and Modelling

We realized that more interviews were needed to better understand the domain and to create better personas; the people that we had interviewed so far worked at very different companies and had very different personal motivations, and it was clear that there was a lot more to be learned. With three more interviews conducted we created personas using Cooper's process for persona creation, described in 4.5.1.4.

6.3.1.1 Interviews II

The first iteration of interviews had given us a lot of useful data about three different companies that have a strong motivation to become more sustainable. We realized that this dedication and motivation might differ from regular companies. Thus, we made the decision to do a couple of additional interviews with regular companies to get a better understanding of how they think of sustainability at their company.

Many companies were identified and contacted. We attempted to find companies in Gothenburg, that did not have sustainability as their core business, such as restaurants, tech companies and gyms. We managed to book an interview with an accounting assistant at a gym franchise, a chief financial officer at a science park(CFO) and a manager/chef at a local restaurant. The interviews were, as in the first iteration, semi-structured. We attempted to find out matters like:

- What do they know, and what do they want to know about sustainability?

- What current similar products do they use, and what experiences, if any, do they have with these products?

- How does the decision to make a purchase happen at the company?

A total of three interviews were held, lasting about one hour each. We recorded the audio of the interviews so that we did not have to focus on note taking.

6.3.1.2   Results from Interviews II

The interviews were summarized and that which seemed useful for the persona creation or as feedback on the design was extracted. Below follows some of the important insights from the interviews.

Motivation to act sustainable

In the first iteration, we were quite surprised by the interviewees' knowledge and motivation tied to sustainability. Apparently, sustainability is a big priority for all three interviewed companies. This time, the answers were in line with what we expected from the start of the project; that they wanted to act more sustainably but that they did not have the time or resources to do so. The accounting assistant told us that they would like to become more sustainable, but the customers appeared to want a lower price more than a more sustainable gym. All the subjects told us that the companies they buy from often could not give them the information they needed to choose the more sustainable option.

Alternative ways to make the company sustainable

Since there does not exist a product that is similar to the platform that Normative provides, there was no current product that we could compare and find issues and frustrations with. However, Normative solves the issue of planning and seeing a company's environmental impact, thereby helping companies make more calculated decisions. Thus, we had to view their discussions and thoughts about sustainability when purchasing a new product as their current way of solving, or in many cases getting around this issue. The companies seemed to have many ways of addressing this. At the science park they use a wiki that employees are encouraged, but not forced, to follow. Other rules such as buying organic or locally produced were considered as ways to get an overall lower environmental impact without having to do research about every single product that they buy.

Overall it seemed like many of the environmental decisions were based on guesses or rules of thumb in lack of better data. We realized that while there is a lot of data available about most products, these three companies do not have the time to conduct this kind of research. We came to the conclusion that providing this information through Normative would have to be quick and easy to access in order to help the users make more calculated decisions.

Technical issues

When we discussed Normative with the accountant assistant at the gym, there was a discussion about the way Normative collects data from bank transactions. We were told that companies often make their payments in bulk, thus hiding the individual transactions. Accounting software on the other hand contains more information about individual purchases. It was important for us to realize that accounting data contained more detailed data than bank transactions, as Normative chooses between these two inputs to perform their sustainability calculations.

6.3.1.3 Persona Creation

With the data that we had collected during our interviews from both iterations, we continued the persona creation process as described in 4.5.1.4. We attempted to extract different attributes or behaviour, henceforth *variables*, from the interview subjects. The variables that were considered to be relevant were:

- Works with purchases.

- Has a lot of power.

- Works with accounting.

- Care about sustainability.

- Flexible in changing.

- Interested in company growth.

- Is highly educated.

- Has a lot of knowledge about sustainability.

- Has a lot of knowledge about economy.

- Sustainability is a large motivational factor for working within their given area.

- Money is a large motivational factor for working within their given area.

- Status is a large motivational factor for working within their given area.

- Sense of purpose is a large motivational factor for working within their given area.

- Job security is a large motivational factor for working within their given area.

- Family is a large motivational factor for working within their given area.

- Has a lot of social skills.

- Has a lot of technical skills.

- Is a quick learner.

The six interview subjects were then rated on each variable based on the way they had answered different questions. Extracting implicit answers without making things up was the key at this point. The subjects were positioned in the order in which each variable corresponded to them. The more accurate it was for the subject, the more to the right the subject was placed. The names were also colored to distinguish better between them, as seen in image 6.13, where the different letters represent different subjects. After this, subjects with similar positions in many (more than six) variables were identified, and we tried to decide if there was a valid connection between the variables. This meant that some combinations were discarded, as they did not seem to represent a coherent behaviour.

We found three useful combinations of subjects. One of them turned out to have variables that were hard to combine into one coherent persona: someone with little power that worked with accounting, probably an economical assistant, were to be combined with someone that had sustainability and a sense of purpose as their primary motivation for working. We made the judgment that based on these variables, and also on other factors that we knew about from the interviews, there was a missing persona that was an entrepreneur, with very strong principles and values. Thus we divided this behavior into two personas.

Out of the four patterns of behaviours that we found we created four personas. One of them, Leila, is a manager with power and interest in company growth, yet educated about sustainability, with strong values but still a will to compromise, become our main persona. The reason was that people in her position had the most power and potential to make a change to become more sustainable; they have both the ability and motivation.

We also created three secondary personas:

- Stina, who works as an economy assistant and mainly just wants to make a living and be good at her job.

- Simone, an entrepreneur with strong values that rather does the "right thing" than make a lot of money.

- Martin, who runs a fast growing company that he believes would benefit from having an environmentally friendly public profile.

All of the personas can be found in Appendix D.
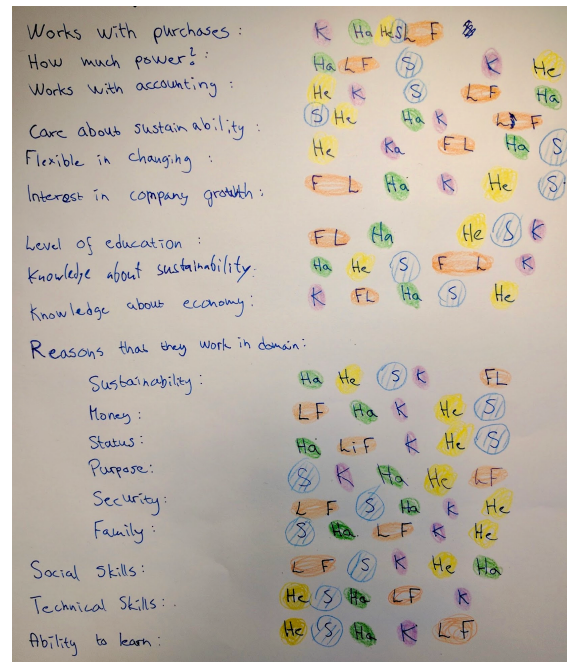
Figure 6.13: Interview subjects mapped to behavioural variables.

6.3.2 Requirements Definition

Building on the problem and vision statement from the first iteration, we could here make use of our newly created more detailed and nuanced personas by creating scenarios and putting our personas in them. The scenarios were then used to create functional and data requirements.

6.3.2.1 Scenarios Creation

Using the main persona, a scenario was created with a description of how the imagined product would be used by the persona to achieve their goals. The personas goals served as a starting point for what the scenarios should contain. Due to time limitations, we created scenarios for our our main persona, Leila.

The main scenario considered for persona Leila was the following:

1. Leila gets an email from the purchasing department were she is asked to give feedback on a few suppliers. The engineering department has requested to buy supplies for a new robotic arm.

2. Leila checks Normative to see if the companies have agreed to ABB's code of conduct. One of the suppliers, Evil Corp, has not, so she orders the app to send them a message requesting that the sign the code of conduct.

3. Leila then creates a shopping basket of items needed for the arm, and compares what environmental impact it would have when bought by the different companies. She sees that three of the suppliers, (Evil Corp, Hooli, Vandelay Industries) would have a projected success on their environmental goals. Since Evil Corp has not yet signed the code of conduct she decides to wait one day with the decision.

4. The next day Evil Corp has not answered the request, so Leila decides to exclude it from consideration.

5. Hooli has the lowest impact on most metrics, but Vandelay has a much lower cost, so she decides to recommend both to the purchasing department. She emphasized that the difference in impact is not that big.

6. The purchasing department decides to buy from Vandelay, and as soon as the order is registered in the accounting software, the order appears in Normative. Leila can see the order, and that many data points, such as carbon emission has increased. The company's environmental goals are still projected to succeed.

The goal with this scenarios is to help Leila be effective and good at her work, while at the same time giving her the *ability* to select the more sustainable options. It also helps her keep track of the companies environmental goals.

All scenarios can be found in Appendix E.

6.3.2.2   Defining functional and data requirements

The objects, actions and contexts where identified in each sentence from the scenarios, as mentioned in 4.3. These were then discussed and refined. We realized that some of them were different words for the same thing, such as supplies and products. These were merged and modeled as the more suitable name, in this case product. Some were not made into requirements, as they did not represent a part that we though would be in the platform, such as *email*. To get a better overview, we created a model that represented the part of the domain that would need to be in the platform. The model can be seen in Figure 6.14, in which the arrows represent actions that connect the contexts and objects.

6.3.3   Design framework and refinement

The scenarios that we created revealed some new features that would be helpful for the personas to reach their goals. Since we decided to focus on the persona that had a high motivation to become more sustainable, there was an overlap between our target behaviour, to persuade the user into making more sustainable purchases, and the main personas goals. Leila wants to make her company more sustainable, but she also wants to save money by using automated tools that speed up her work. We believe that we can achieve both the target behaviour and Leila's goals by focusing
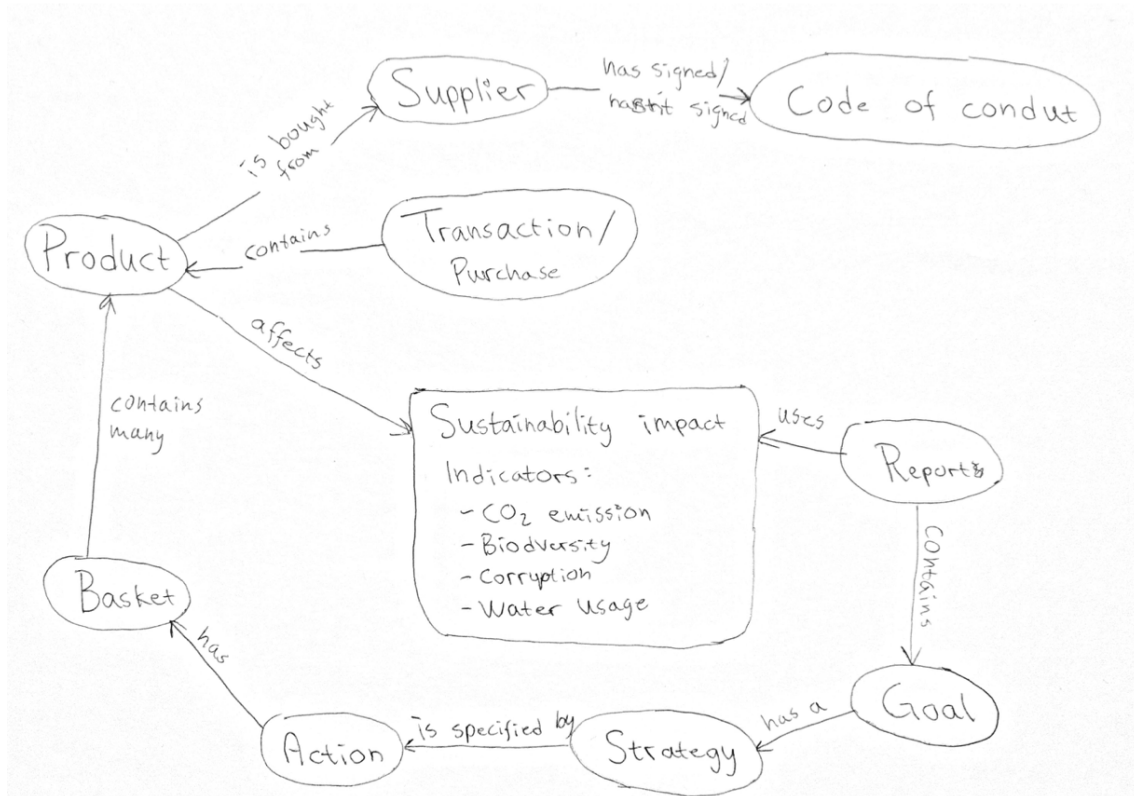
Figure 6.14: Functional and data requirements mapped together.

on the *ability* for the user to make their company act more sustainably. The features identified from the scenarios was:

- Sustainability goals that the user could follow over time.

- A planning tool that would give feedback *before* the purchases are actually made.

- Since there is no sustainability data for individual products, but only product categories, we imagined that this could be provided by the user in the cases where they can be obtained. Optimally this would also be shared among all users, so that the data continuously becomes better. For products were no specific data is saved, the product categories will still be used.

In this phase we continued to develop these features.

6.3.3.1 Prototyping

In this iteration we designed two main features of the platform from rough ideas to digital prototypes. We also introduced a new function to accounting feature that we designed in the last iteration; a function to deal with many transactions at once.

This was a feature requested from the CEO of Normative, who uses Normative daily.

Goals

Different sketches were made for the *Goals* view. We first drew versions including a list of goals where each goal was an expandable list item holding more information about the goal and how to reach it, as seen in Figure 6.15.
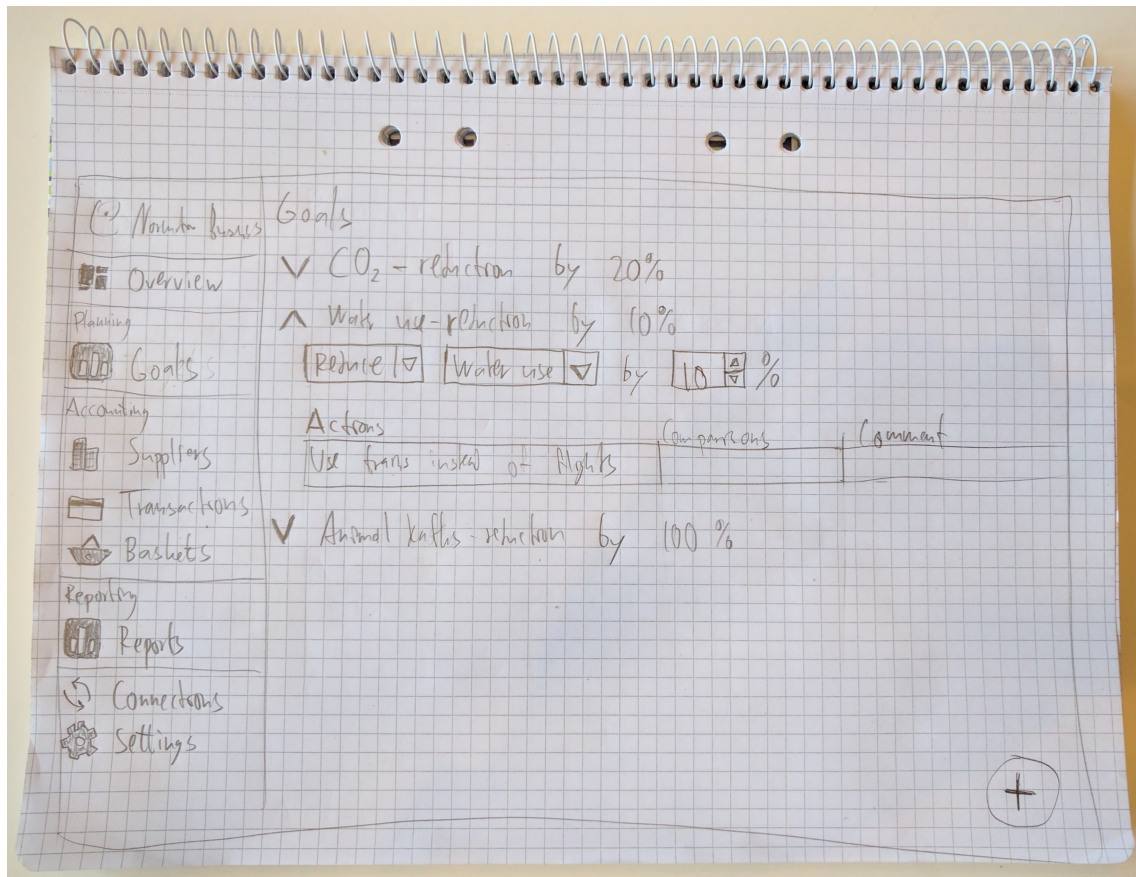
Figure 6.15: Sketch Goals.

We then decided that it was important to have the goals visual and easy to overview. For this reason we went in the direction of having each goal as a card, both including its basic data but also a graph of its progress. This provided a clear overview of each goals and its progress, as seen in figure 6.16.

Since the information of each goal had to fit into a quite compact card and should not be cluttered, we could not show all of its information there. This was solved by creating an expanded goal view in which details about a goal could be viewed and edited. This would essentially be the same view as the one for adding a new goal, with the only exceptions that one would fill in data from scratch and that one would edit existing data.
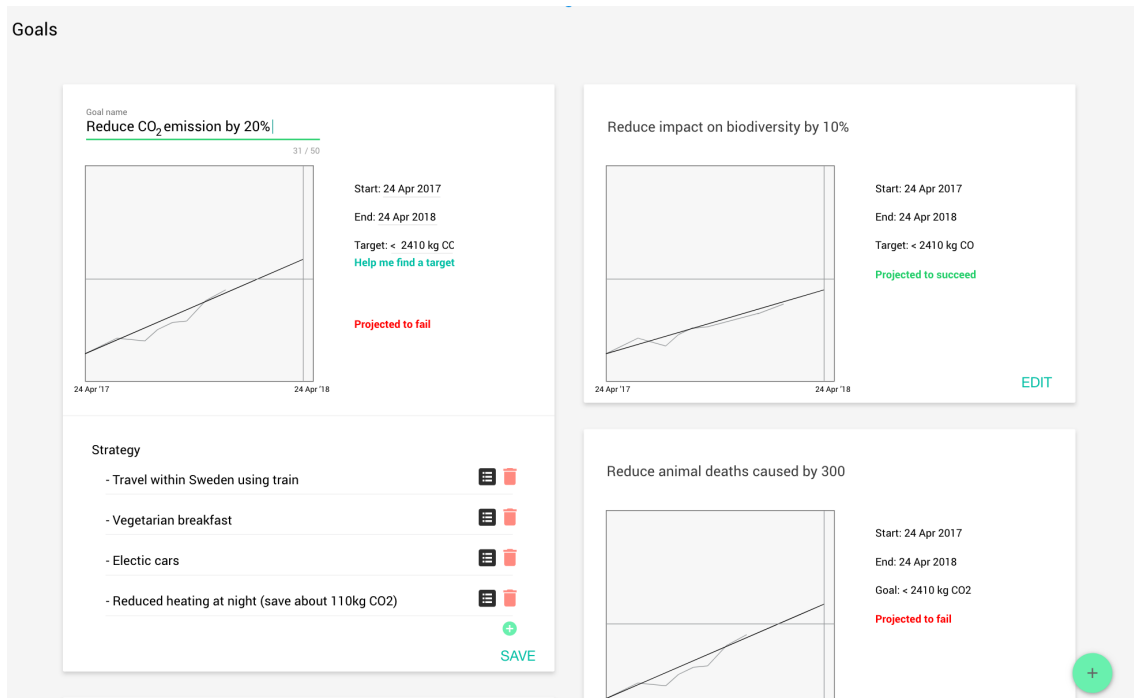
Figure 6.16: The goals view with one goal expanded.

We created two different ways of setting a goal, a manual way, where as much of the input is provided by the user, and a guided way. The guided way uses the ideas of tunneling, as mentioned in 3.3, which helps the user set clear goals for its company. The feature can be seen in figure 6.17.

Procurement Planner

The procurement planner is an essential part of the application. In order to make the more sustainable decision, it must be as clear as possible for the user what that option is. It was also one of the most important feature in our scenario that centered around comparing alternatives and finding the most sustainable one.

For the comparison to work we needed things to compare. Since a purchase often consists of many different items we thought that some way to group items together was needed. We decided to go with the name *basket* for these item containers. Initial sketches for a baskets-view can be seen in Figure 6.18.

The comparison however was trickier and many concepts were discussed. One option was to pick two different sketches were the difference in various environmental metrics were shown, providing information of the alternative that the system judges as the most sustainable one.

However, we realized that the case often would be that more than two baskets
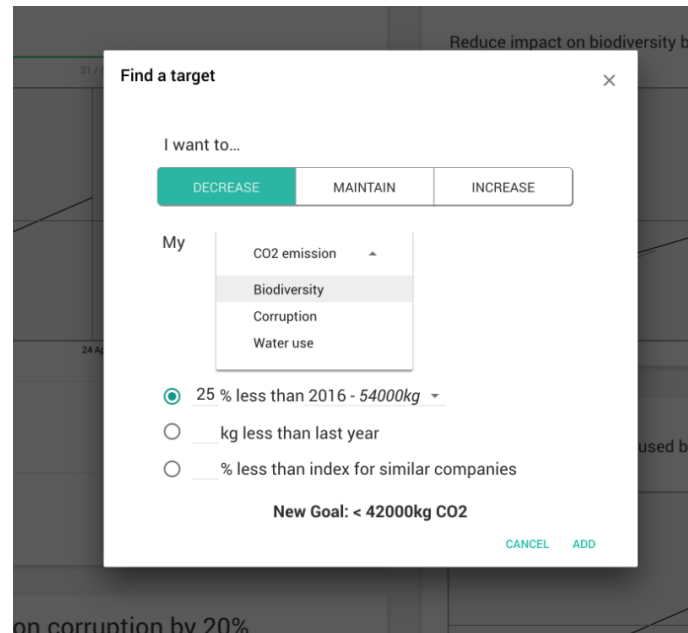
Figure 6.17: A guided way to set sustainability goals.

needed to be compared. It was discussed whether this could be solved by showing the difference between one baseline basket and all other baskets. It was however unclear what this baseline should be; should it be the most sustainable one? If so, which indicator can be used to conclude which basket that is the more sustainable?

We looked to our persona and realized that she is a smart user who probably wants a lot of freedom when using the program. We wanted her to be able to compare on her terms and in as high detail or with as many baskets she wanted without restriction. We decided to list all the baskets in a table with a column for each metric. By clicking a column she would order the items and could then for herself decide the better alternative. The comparison could be done to all saved baskets or to a selected subset using the filtering function or by selecting a set of baskets(using the compare button seen in top right corner of Figure 6.19).

The view also had the option to tag one or many baskets, which then could be used as a shortcut for comparing the same things in the future. Also an export button was added so that comparison could be used outside of the program for reports, presentations and so on.

In order to keep consistency to the app, the rest of the features are similar to the ones in the Transactions view, that is adding, editing and deleting.

The final sketch of the *Procurement Planner* was the one in Figure 6.19.

The sketched ideas were then transformed into digital high fidelity prototypes using Adobe Experience Design. The result is shown in Figure 6.20.
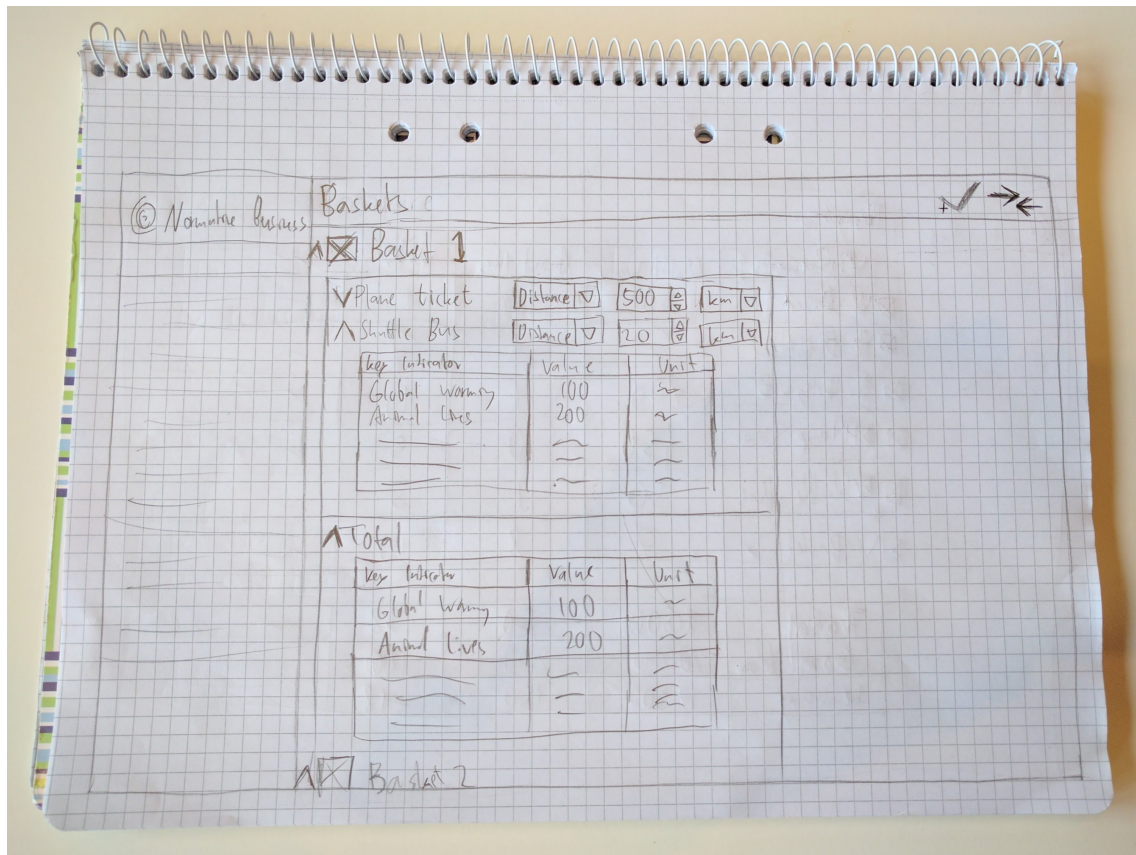
Figure 6.18: Sketch of Baskets.

Feature to handle many transactions at once

The CEO of Normative, Kristian, realized when he was continuously using the platform, that he often needed to apply the same ratio of products to transactions with the same transaction name. For example, he might have 200 transactions from his energy company, to all of which he would like to add 50% wind power and 50% solar power. In order to speed up this process, we designed a feature that would allow the user to apply the same ratio of products to all transactions of the same name. This dialog would appear when verifying a product, offering the user to verify others that had the same description. The feature can be seen in Figure 6.21.

6.3.4 Evaluation

In the second iteration of design, we wanted to evaluate our prototype. Optimally, we would have liked to evaluate the persuasive capabilities of the platform over time. Due to the time that was given for this project, this was not possible. To measure how a company acts over time would take several decision cycles; which could be three months or a year each for a company. In addition to this, Brynjarsdottir et al.
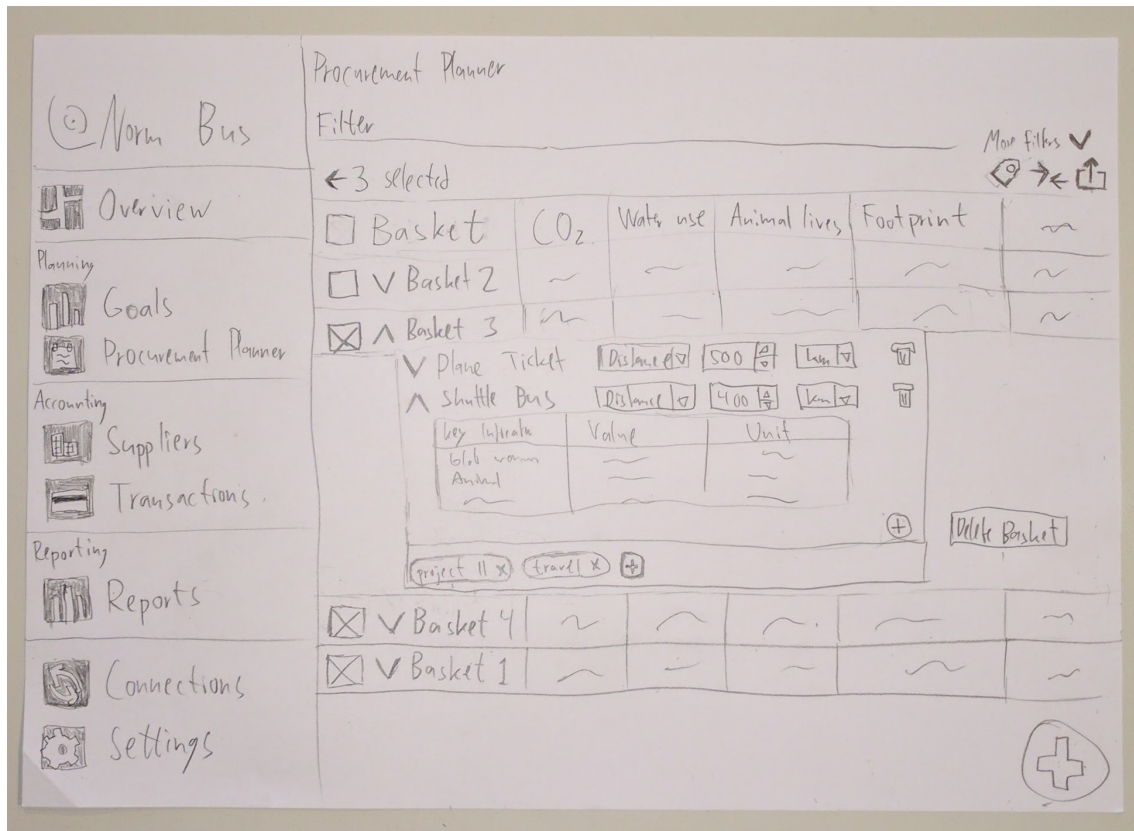
Figure 6.19: Sketch of Procurement Planner.

(2012), previously mentioned in 2.2.3, state that 3-4 weeks is probably not enough to go beyond novelty effects for evaluations of persuasive products. To make sure that the decisions that were made were clearly affected by our platform, a decent sample size and not just a few companies would need to be studied. All this would require time and resources beyond this master thesis.

Instead, we decided to get feedback from the people that work at Normative.

6.3.4.1   Think-aloud II

In order to get feedback on the interface, we conducted think-aloud evaluations with 3 employees at Normative: Kristian(CEO), Adam(CTO) and Sebastian(developer). They gave us valuable feedback that we used to improve our design.

We wanted to use their expertise to find out:

- Does the prototype reflect the domain correctly? Is the wording and the relationships between them correct?

- Is the flow of interactions understandable and effective?
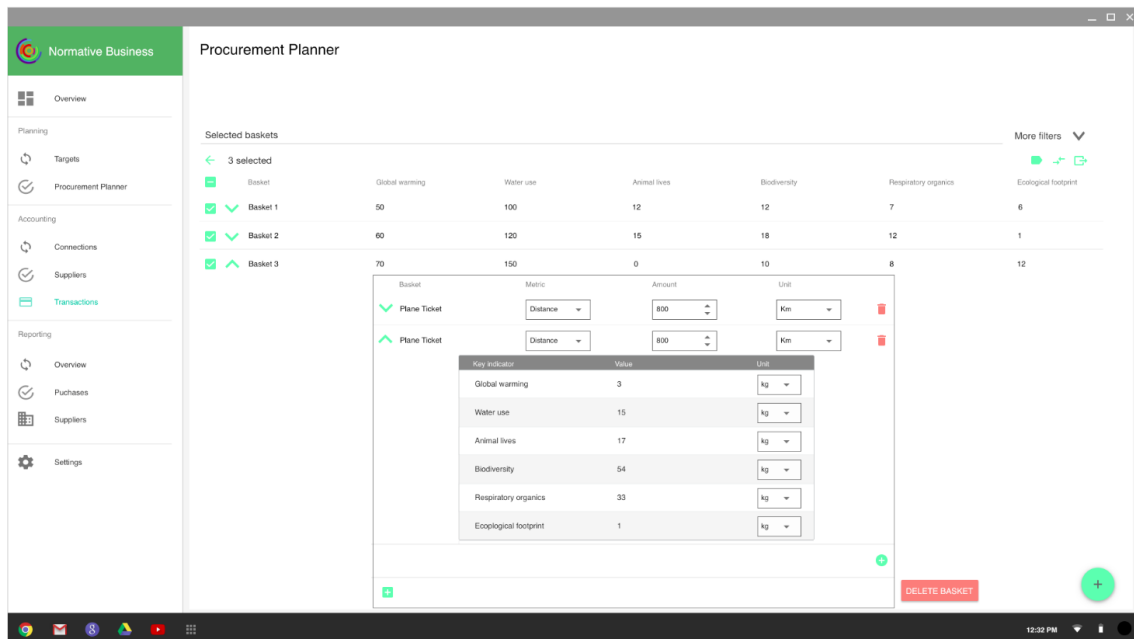
Figure 6.20: Hi-fi prototype of Procurement Planner.

- Are the scenarios that we have based them on realistic?

The employees had some interesting angles that we thought would yield useful feedback. For example, the CEO of Normative uses the platform daily to calculate environmental impact of a few different companies, and thus serve as a power user. All three of the employees were experts in the domain and could comment on some misunderstandings that we had about it. One of the interviewees had not worked on the actual product, and was completely new to the platform and could thus help us understand what areas of the design that was difficult for new users to grasp.

The think-aloud method (mentioned in 4.5.4.1) was used as an evaluation method. Anton went to Stockholm to conduct evaluations with three subjects in the Normative team. The evaluations were done with one subject at a time. Each of them was given the latest design prototype as a slide show of the flow which they were going to take to accomplish the tasks given (shown in appendix F).

The evaluation gave us a lot of input about things to improve in our prototype. In many ways this could improve our design and make it easier to understand and quicker to use. According to the theories of Fogg, as mentioned in 3.3.2.1, reducing the amount of steps to do something can help the user reach the target behaviour. Helping the user understand the platform by improving areas of the design that were confusing to the user can also help increase the ability of the user.

Some concrete changes to the prototype that came out of this think-aloud session were:
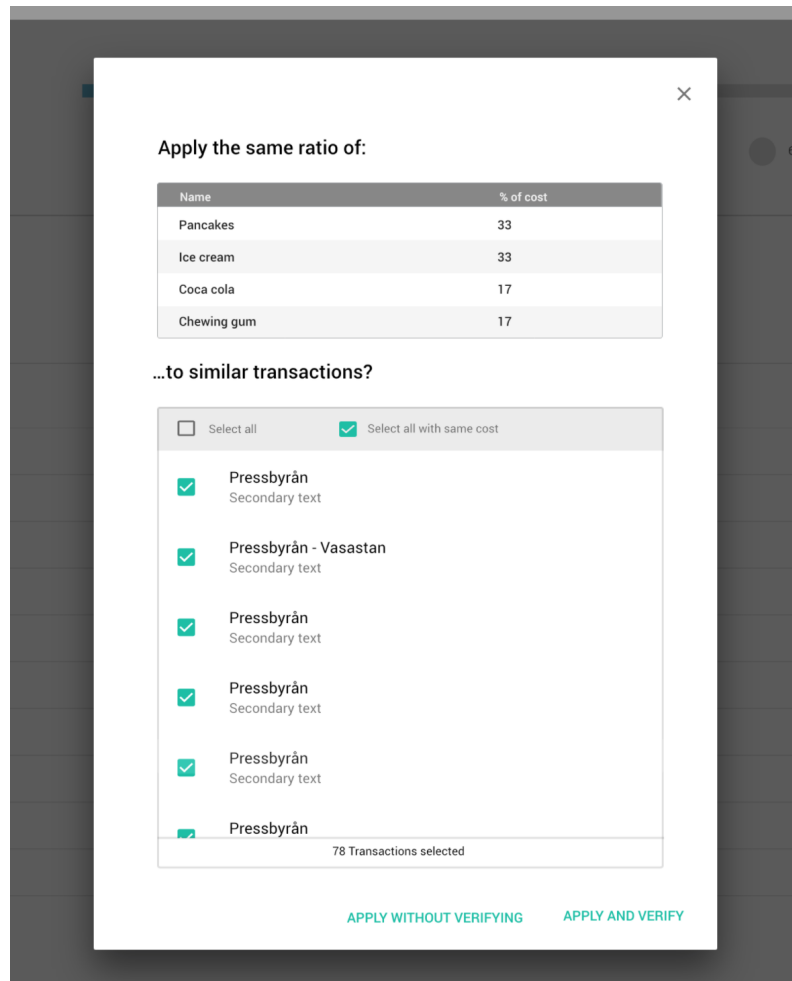
Figure 6.21: Hi-fi prototype of Verify Similar.

- The dialog offering the user to apply the same ratio of products to many transactions that previously was design to magically appear when a transaction was verified is now triggered manually, so that the user can use it whenever they want.

- Lots of wording and icons were replaced and clarified, to better follow the user mental model. This can increase the *ability* since there might be less misunderstandings, and *reduce* the time it would take to learn to use the system.

- Some misunderstandings on how the domain worked was cleared out. For example, it turned out that the indicators that we had designed to fit about ten of in a view could be as many as 100 in reality, thus it needed a more compact design.

Since this was our last design iteration the evaluation feedback could not be used

in an upcoming design iteration. Instead we decided to use the feedback to modify the prototype directly. We also documented the feedback so that it can be used in future iterations.

6.4 Implementation

In order to make use of the design from previous steps we wished to implement it into a working prototype. During this project, a prototype would allow us to implement some of the design ideas, as well as test some aspects of it. It was also a request from Normative that we should extend the existing Normative product, and not just suggest design ideas. However, the time that we had did not permit us to implement all of the features, and because the accounting functionality was key for Normative, we decided to focus on that feature.

6.4.1 Accounting

We started by implementing the table that contained all of the transactions. The table had to be able to load tens of thousands of transactions when the user scrolls, thus we decided to implement our prototype in Angular, which is a lot more performant than the previous AngularJS, which was used in the current Normative build. This was solved by letting us implement this in a sand-boxed Angular environment, which then either would be lifted into the current Normative App as soon as it had been made Angular compatible by the Normative team, or work as the new base for the entire app so that the other features would be added to it as they were rewritten in Angular.

Since tables were a central part of the implementation and, at the time of this project, Angular had not finished its work on its table component, *data-table*, we had to look for other solutions. We found a powerful alternative in *Ngx-datatable*, which is an open-source project made by the company Swimlane (2017). The table that showed all the company's transactions needed to be able to show at least up to 10 000 transactions in an virtual scroll-view, that is, a view that acts like a normal scroll view, but does not actually render the transactions that are not currently visible. This way, a lot of performance issues are avoided. We tested the table with 10 000 and 100 000 transactions and concluded that it worked with almost no delay with 10 000, and with some delay but still usable with 100 000 transactions. According to Normative, very few companies would have more than 10 000 transactions, so we decided to use this solution.

Transactions consisted of several sub-components. Overall it used a service that would retrieve the transaction-data from the server into the transaction component. From here the transactions were modelled so they could be manipulated from the GUI where they could be verified/unverified, added, deleted and edited.

The table of transactions was implemented as seen in Figure 6.22. Since the trans-
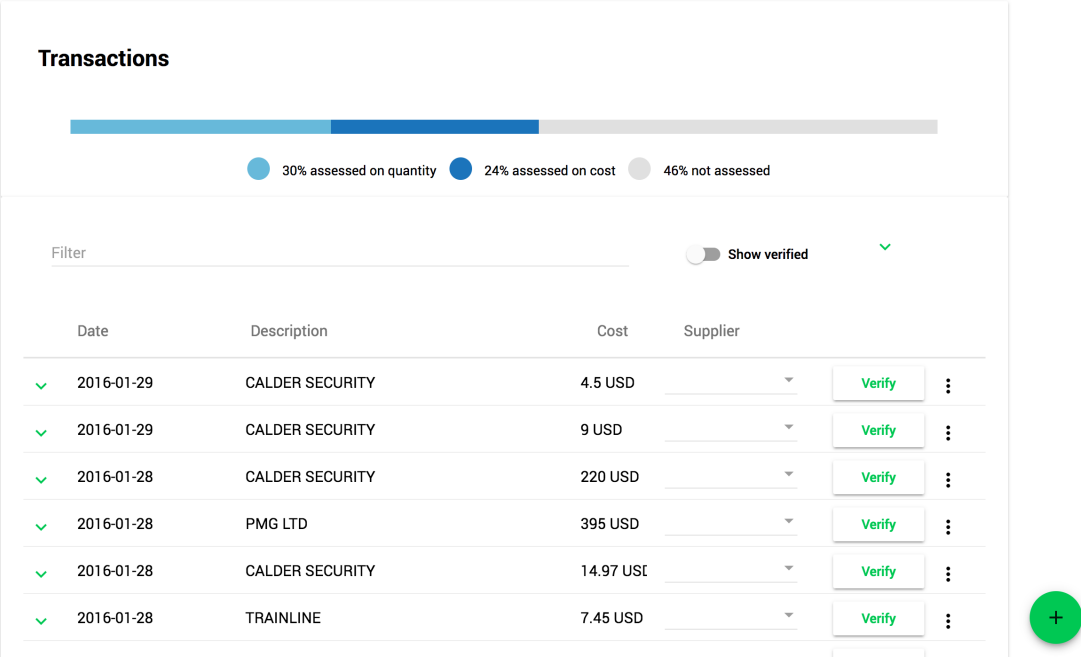
Figure 6.22: The final look of the implementation of the Transactions-view

action table also had a nested table of products for each transaction, a similar implementation was done here where products could be added, deleted and edited in the GUI.

Filtering features were also implemented where the user could specify a search string and intervals for dates and costs. The filter would then be applied to the transactions-array only rendering the ones matching.

Regarding the verify-functionality, a feature for *verifying similar* transactions was also implemented, as previously discussed in 6.3.3.1. This was accessed by pressing the *Find and verify similar...*-button in the context menu on a transaction. The feature would then list the transactions similar to the current one, as seen in figure Figure 6.23. The user can then select the transactions that they want to add the ratio of products to, and verify all of them directly, or just add the products without verifying.

Since each product had information from one UNSPSC-code, we also implemented a picker for selecting a code from this four level hierarchy, as seen in Figure 6.23.

6.5 Analyzing challenges

During the final phase of the project, we started to gather all of the challenges that we had encountered during the design process. Many challenges were discovered
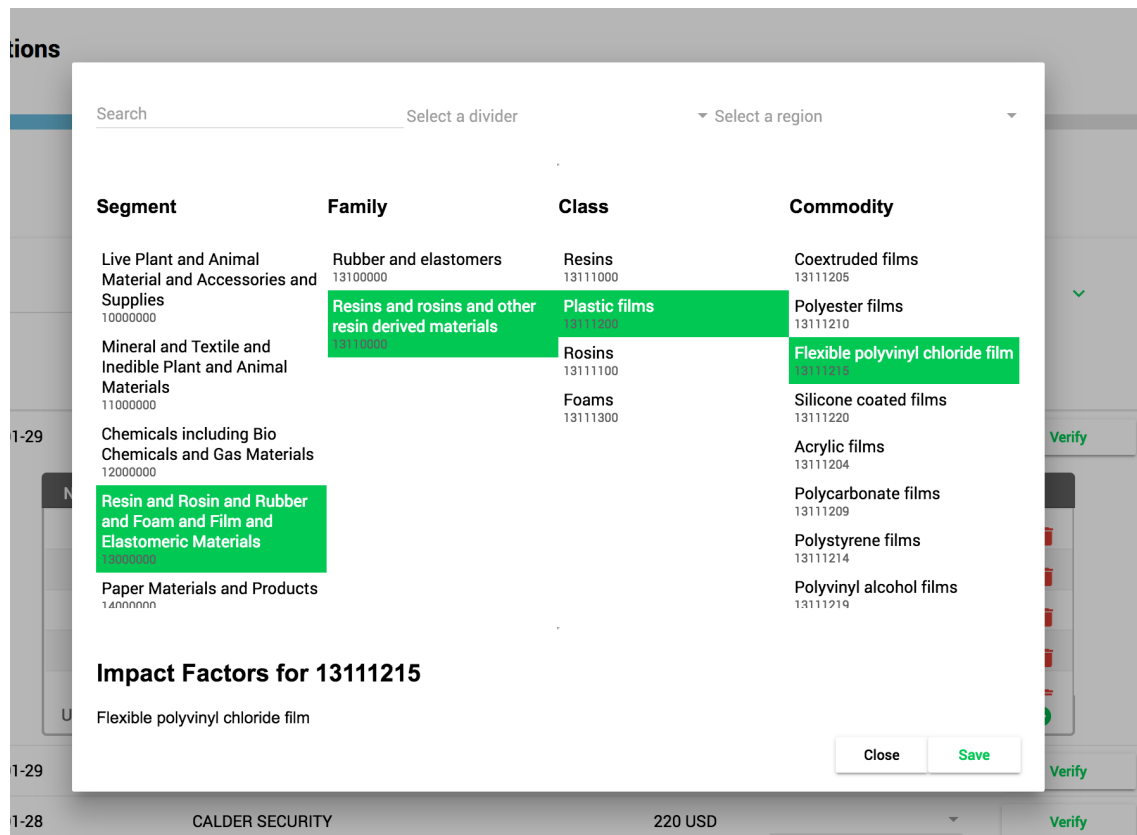
Figure 6.23: A dialog to change the product category.

implicitly in our various activities. We conducted a brainstorming session to identify the most salient ones to highlight as our result. Some of the challenges, such as the various ways that products like Normative could be evaluated, were not the direct result of any particular activity, but rather from knowledge that we had gained throughout the entire process.

The challenges were then grouped using the KJ-method, mentioned in 4.5.2.3, and the groups were then used as sections in our results. The final challenges can be seen in figure 6.24 and can be read in chapter 7.
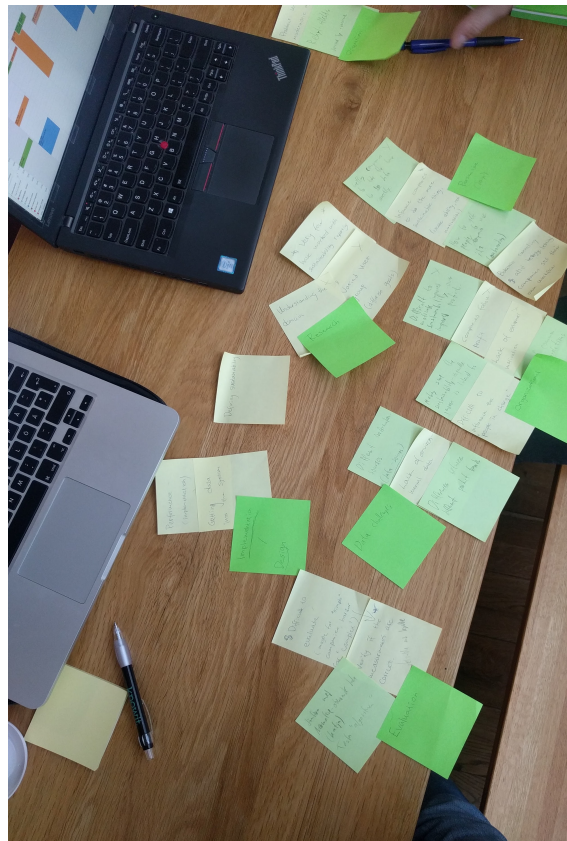
Figure 6.24: The challenges identified during the brainstorm session.

7

Results

This project has explored how persuasion could be used in design to encourage companies to act more sustainable. While doing so, we have contributed to redesigning a product, Normative, which tries to do exactly this. We have learned a lot from both doing user and literature research and prototyping Normative. The results of the project consist of three different parts:

- A set of challenges that can serve as a starting point for further research.

- A set of heuristics that can be used to guide and evaluate persuasive products that attempt to make companies more sustainable.

- Prototypes

  - A non-functional prototype of a redesign of Normative, a web application that attempts to make companies more sustainable.

  - A functional implementation of Normative's accounting features designed in the non-functional prototype.

This chapter describes these three types of results.

7.1   The Challenges

During the activities of this project we have identified many areas that need to be taken into consideration when designing products that attempt to help companies act more sustainably. As described in 6.5, we have divided these into different categories. All of the challenges are listed here, and are described in detail in the rest of this section.

Research challenges

- Varied User Group

- Hard to get hold of professionals working with non-financial reporting

- Understanding the Domain

- Lack of framework in persuasion regarding companies

Implementation challenges

- Displaying a lot of data without lag

Evaluation challenges

- Evaluating the platform's calculations

- Evaluating if the actual impact is measured correctly

- Evaluating the persuasive capabilities

Challenges with calculating sustainability impact

- Gathering company data

- Finding sustainability data

- Finding the impact of a specific product brands

- Legitimacy of different data sources

Persuasive design challenges

- Getting the companies to enter and verify data manually

- Comparing different indicators

- On-boarding

- Finding the balance between tunneling and flexibility

Organizational challenges

- Lack of external motivation

- Reaching key people at companies

7.1.1 Research challenges

Designing products for companies involves understanding the users at different companies, as well as to understand many areas of theory. This section describes the

research challenges that we have found during our work.

7.1.1.1 Varied User Group

During our research we realized how varied and complicated the decision process of a company can be. We realized that there are lot of different factors that decide what the employees at a company are inclined to do, such as personal ethical values, size of the company, the motivations of the company's customers etc. This has the effect that it can be hard to model or capture the characteristics of a typical user. Even when we managed to model a few different user types, designing for all of them might not be the best idea. Rather, it might be better to realize that the product should be targeted to a certain type of business, such as big companies with a dedicated sustainability expert, or to have different modes in the application, for different kinds of users.

7.1.1.2 Hard to get hold of professionals working with non-financial reporting

When learning about the domain, we were told that at some companies, there were people that worked exclusively with non-financial reporting. Obviously this became our primary criteria when we looked for people to interview. They would have a lot of knowledge about non-financial reporting as it has been done in manual ways, and would be familiar with the quirks of the profession; things that potentially would need to be included in our product. It turned out that this role was quite rare, and we only managed to talk to one user that had previously worked with sustainability reporting.

7.1.1.3 Understanding the Domain

The domain was complex as it consisted of interdisciplinary studies of sustainability, persuasive design and psychology.

Sustainability

In economics the main concern, simplified, is to make sure more money comes in than goes out. In sustainability however, instead of having one variable, you have to take into account a vast amount of variables at the same time. This, in a way, is also the case regarding economics if different currencies and types of investments are considered as different variables. However, in economics there are rates between currencies and ways to calculate the return on investments. In sustainability however there is no clear way to compare different variables of sustainability measurements, which is covered more in 7.1.5.2. This makes the sustainability domain more complex, thus requiring more time and effort to understand.

Something that makes sustainability even harder to grasp is the fact that it is defined

in different ways, as mentioned in 1.4. As discovered in the interviews (6.2.1.3), the energy company also wants to include non-environmental human values such as corruption and conditions in the work place. Normative has also hinted in their information video at their website (Normative 2017b) that there is an ambition to also include customer satisfaction and employee diversity.

Persuasive design and psychology

Brynjarsdottir et al. 2012 analyzed persuasive sustainability research from 2009-2011. The authors analyzed 29 papers, of which only two were within the context of a company. Both of these targeted individual change rather than organizational. Thus, persuasive design targeting companies has not been investigated in-depth before, and it lacks a framework of how to work with it. Because of this it was required to also understand the underlying psychology that persuasive design is built on. Also, since the existing research in the field is concerning individuals we had to apply the delimitation to focus on persuading key individuals which then in turn could persuade the rest of the company.

7.1.1.4   Lack of framework in persuasion regarding companies

When creating persuasive products for individuals, there is a lot of theory that can and has been applied, as mentioned in 2.2.1. Most notably, there are Fogg's persuasive strategies and the factors of persuasion, mentioned in 3.3. These theories often assume a single individual who can be triggered or motivated. We found that individuals in the context of a company does not necessarily adhere to factors like these, but are often more rational in their behaviour. For example, the chief sustainability officer (CSO) at the energy company told us, mentioned in 6.2.1.3, that people working with non-financial reporting are already motivated to be sustainable, but that she needs tools to show to the other managers how to do so, and what the company will gain from it.

All in all, we found that some of the theory about persuasive products can be applied to people within companies, but that a comprehensive framework for doing so is missing. Out of the three factors of persuasion, ability, motivation and trigger, we speculate that creating *ability* to become more sustainable could be more applicable to companies than the other two. As mentioned in 3.3.1, a high motivation will not help if the ability is too low, and at companies the individuals who use Normative might not always have the ability to change the actions of the company. This is where the reports that Normative generates play a role, as they can have an effect on others at the company. These hypotheses regarding ability however needs to be be further investigated.

The theory of persuasive design describes simplified guidelines and strategies to design for individuals. In order to move forward when designing persuasive products that attempt to alter the way companies behave, similar simplifying guidelines for companies are needed.

7.1.2 Implementation challenges

In this project we have implemented a web-application, using Normative's current back-end to get data and perform calculations. Because of the time limitations, we have only implemented the front-end logic. Many challenges regarding the development of modern web applications were encountered during the process, but as our research question does not specify implementation details, we chose not to go into any of them but one: Displaying a lot of data without lag. This challenge is technology agnostic, and would most likely be needed to be considered when creating products similar to Normative.

7.1.2.1 Displaying a lot of data without lag

A platform like Normative that attempts to measure and evaluate everything that a company purchase needs to be able to handle large amounts of data. While this project did not deal with the back-end side of the implementation, the front-end needs to be able to handle and display at least 10 000 transactions in a so called virtual scroll, as described in section 6.4.1. We solved this by using a library called Ngx-datatable (2017), and tested the performance of it, verifying that the lag times did not became too long.

7.1.3 Evaluation challenges

With the complex domain comes the difficulty to evaluate the validity and reliability of Normative's calculated results. The behaviour changes that we strive to achieve with Normative can also take time to observe.

7.1.3.1 Evaluating the platform's calculations

Since the way Normative performs the calculations of all the user's data is hidden from the user, it is hard, from a user's perspective, to know whether these are executed correctly and reliably. The fact that sustainability metrics can be more abstract and harder to grasp can make it even harder for a user to know if they are reasonable. A way to evaluate this could be to let Normative calculate the sustainability values on a company that already have an existing sustainability calculation. The metrics could then be compared, giving a hint if Normative and the company have reached a similar result. This approach would however only say that the Normative algorithm works for a certain company, and only as well as the old method of making the calculations. However, if this is tested on many companies with similar results one might be more confident that the calculations done on a new company is reliable as well.

7.1.3.2 Evaluating if the actual impact is measured correctly

Measuring if the calculations are correct according to the data that Normative uses, as mentioned in previous paragraph, would verify that the platform does what it promises to do. However, knowing that the platform correctly adds the data together according to the data and rules that are provided is not the same thing as to verify that the platform calculates the *actual* impact that a company is responsible for. In fact, for most companies this is probably not possible at all considering how complex the globalized trade is. There simply is not enough data about specific brands of products to make this sort of calculation. Therefore, we can only hope that the calculations that are made using simplifications such as product categories associated with sustainability data for that type of product give something that is close to reality, but it would be close to impossible to prove that it in fact is valid.

7.1.3.3 Evaluating the persuasive capabilities

As mentioned in 6.3.4.1, the time frame of the project was limited. Ideally we would have needed more time to be able to test if a change in the design would actually lead to a new persuaded behaviour. Then we could have compared the sustainability data after the design change with the data before the change and see if it differed as expected.

7.1.4 Sustainability data challenges

In order to make companies act more sustainable, Normative calculates the sustainability data of a company and displays it to the user. This is an ambitious task with many challenges. This section describes the challenges we have encountered during our research.

7.1.4.1 Gathering company data

To make calculations, track sustainability goals and give the user analyzes, data about the company need to be provided to the system somehow. One could imagine this coming from many different sources. In 2.2.2, the power consumption of a company was measured directly. Many other things such as driving distance, direct water usage or direct CO2-emission could be measured directly by companies, but this leaves out the indirect consumption that the companies produce by purchasing products and services.

The approach Normative currently use is to collect data about everything that a company buys. As described in 6.1.2, the purchases are then mapped to different product categories, which in turn Normative has sustainability data about. Normative has previously used bank transactions as a basis for the data, and then let the user fill in the details of that transaction. For many companies this works poorly; As mentioned in 6.3.1.2, the accountant manager at the gym told us that the pay-

ments are often made in bulk-transactions, thus loosing a lot of information about the individual items that were purchased. Data from accounting software however tend to have more information. Often, they already contain a product category that can easily be mapped to a product category that Normative has sustainability data about. When this is not possible, the user has to inform the system about the products that was purchased, more on this in section 7.1.5.1.

7.1.4.2 Finding sustainability data

In order to calculate the sustainability data of a company, a database of sustainability data must be gathered. For the indicators that the platform should measure, sustainability data for each product or product category that the platform is using needs to be collected. The data that Normative uses is a collection of life cycle assessments, which is an assessment of the product's impact during its entire life-span, coming from many different sources.

7.1.4.3 Finding the impact of a specific product brands

We defined our target behaviour in section 6.2.1.1 as following:

When the user decides between two products to purchase, they choose to purchase the more sustainable option more frequently than when not using the application.

Because we believe that choices made *before* a purchase is made is a key process when trying to get companies to become more sustainable. When we defined our scenarios in section 6.3.2.1 we realized that this possibly, and for the scenarios we imagined, would mean choosing between similar products. Normative is based on product categories, because sustainability data for individual brands of products normally does not exist. This makes it impossible to use Normative fully for the scenarios we created.

We thought of some solutions to this, and while we did not have time to prototype this feature, we discussed a crowd sourced solution in section 6.3.3.

7.1.4.4 Legitimacy of different data sources

Currently Normative uses a mix of free data sources for its calculations. Picking the most suitable data source can be based on the reputation of the researcher, the year the report is made or other factors. In order for a product like Normative to appear transparent, it is important to clearly display and let the user pick between different data sources when there are several for a specific product. A challenge is however still to make actual sources, and how they were calculated, more available and understandable to the user.

7.1.5 Persuasive design challenges

This section describes challenges that involve persuading the user in different ways, for example, to persuade the user into providing more data or to use the product in the first place.

7.1.5.1 Getting the companies to enter and verify data

In a perfect world, all of the data needed for the platform would be extracted from the accounting software or from the bank that the company uses. However, at the time of this project, a lot of manual work is needed to calculate the sustainability data. The data about transactions are currently automatically added by the Normative platform, but what specific products each transaction contained can only be guessed.

To reduce as much work as possible, Normative uses machine learning to make estimations on what the transactions contained. The user only needs to check to see if the estimations are correct, and then verify.

A progress bar is also used to communicate the system state to the user. This progress bar shows how much the user has left to verify, to encourage them to verify the remaining data.

7.1.5.2 Comparing different indicators

When comparing different products, it would be useful from a persuasive perspective to be able to decide which product that is the most sustainable. Then the application could recommend this product. However, as the different metrics might contradict each other, this is not always possible. For example, consider product A in figure 7.1, which has a high CO2 emission but low water use, compared to product B, which has a high water use and low CO2 emission. Deciding which one that would be more sustainable is both dependent on where in the world the company is located, and on the companies view of sustainability.

Normative uses several metrics when measuring the sustainability of a company. Still, every metric is a simplification of reality. As an example, to consume water does not have the same impact on the environment and society everywhere. To consume water in a place where there is a shortage of water is worse than consuming it where there is an abundance of water. Taking this into account would result in a service that is considerably more complex than the application described in this report.

7.1.5.3 On-boarding

The on-boarding challenge would be different for the primary persona compared to the other non-primary personas. Since the primary persona is well wandered
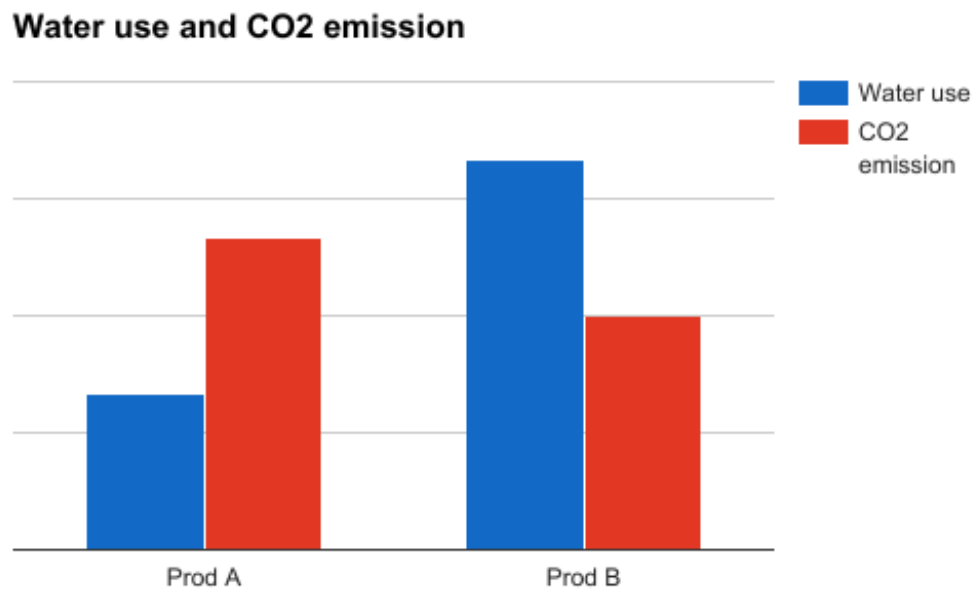
Figure 7.1: Illustration of how complex comparison of products can be with more than one variable.

in sustainability we think that her on-boarding will be seamless, as she knows the domain and only needs to learn the software itself. For the non-primary personas however it might be harder as they need to learn the domain as well. This is why the tunneling aspect is important, guiding the novice user by generating good default values. Thereby a novice user can use the tool before digging in deeper and manually choosing more specified sustainability data.

7.1.5.4 Finding the balance between tunneling and flexibility

It can be very difficult to know how a user would use the product at their company. The companies that we have interviewed have a varied amount of knowledge and motivation within sustainability. For us as designers, it is hard to design a tool within a domain where the user is sometimes more knowledgeable than we are. One must be careful not to make assumptions that are not always true. For example, we could design the Goals feature mentioned in 7.3.1.2 so that the metrics that are considered *bad* would not be able to be set to increase. This may seem like a reasonable assumption, and would tunnel the user in a suitable way. However, this level of tunneling can cause frustration for a user if the designer does not fully understand the domain. Suppose that the company is planning to double in size, and want to set as a goal to *only* increase the carbon emission by 20%, then increasing this indicator would probably be a reasonable action as well. Thus, a higher level of flexibility can be less persuasive in that it does not tunnel the user to act in a certain way, but it is sometimes needed to facilitate all of the user's needs.

This sort of choices are often needed to be made when designing platforms like Normative. When in doubt, we tended to use the more flexible option of persuasion, for example by allowing more choices. If the designer gets more confident that some choices should always be preferred, the choices could be more limited so that the user experience more guidance from the platform, and by extension gets tunneled into a more sustainable behaviour. This must be done carefully with much confidence, so that the user does not experience frustrations because of that the designer has made misguided choices.

7.1.6 Organizational challenges

A lot of work in this project has been invested into understanding the way companies value sustainability. This section contains the challenges involved in trying to change the behaviour of companies to become more sustainable.

7.1.6.1 Lack of external motivation

Fogg (2009) describes the factors of persuasion as *ability, motivation* and *trigger*. As discussed in section 7.1.1.4, motivation might not be as applicable for an individual in the context of a company. On the other hand, a company in itself might have something that could be considered as motivations, or more specifically, the people who run it might have motivations for the company. In this section we discuss some of the external motivations that we have encountered during our research.

Companies follow profit

While some companies benefit greatly from becoming more sustainable, others do not. When we interviewed the CFO at the energy company mentioned in 6.2.1.3, she made it clear that the customers expect them to have a sustainable profile, and that they need to be transparent about it. At the gym franchise though, the accountant assistant, mentioned in 6.2.1.3, told us that the customers where more interested in getting the lowest possible price. This puts the people that run the gym in a tough situation; if they spend money on buying more sustainable (or even spend money on getting to know their impact using applications such as Normative), they might loose customers not willing to pay more.

While this could be true for a lot of companies, we did encountered people who did not appear to want to comprise with their values. The founders of the communication bureau, mentioned in 6.2.1.3, told us that they would rather remain a very small company than to work with companies that they did not agree ethically with.

Regulations

A way to enforce sustainability is to make it illegal not to be sustainable. This was brought up in 1.1 regarding the new laws that make companies, above certain sizes,

present non-financial statements. However, this means that smaller companies that are not required to present a statement still lacks regulation incentives to improve their sustainability.

7.1.6.2 Reaching key people at companies

Normative is a product that can be used by a couple of different roles at a company. For big companies, we saw in our research that the person most likely to use the platform is someone in the sustainability department or finance department, possibly sustainability manager. According to the head of sustainability that we interviewed in 6.2.1.3, people in this role are already motivated and do not need much external motivation from software to want to be sustainable. However, this role often has a limited power to change the way a company makes its purchases. The decisions are often a dialogue in which the sustainability department has input but not decision power.

At smaller companies, the CEO or CFO may often be the user of the platform. This greatly increases the chances for the platform to be able to persuade, but is limited in that the user might not have sustainability as their primary focus.

7.2 Heuristics

Part of the result was the sustainability heuristics that we developed. The heuristic can be used to evaluate the design of persuasive products that attempt to make companies more sustainable, but can also be used to guide the design of them. As described in 6.2.1.2, some heuristics created by Nielsen (1990) were used, in addition to some that we defined ourselves.

- **Shows the difference between the products that are sustainable and those that are not.** - This directly relates to the users ability to act more sustainable. If the user is unable to distinguish the more sustainable option, they are not able to act more sustainably.

- **The interface provides a clear overview of the company's sustainability impact (to those that have the power to change the company's action).** - This relates to the self-monitoring strategy described in 3.3.2.5. As mentioned in 3.3.2.5, if a user, specifically the user that has the ability to change the company's behaviour can monitor the impact in real time, it is easier to keep goals and improve.

- **The interface gives feedback on the decisions that the companies make.** - Surveillance (3.3.2.6) is a strategy to persuade. The feeling of being monitored and judged can help the user become more sustainable, thus they should be given feedback when reporting their behaviour.

- **Match between system and the real world** - The system should speak

the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

- **Consistency and standards** - Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

- **Recognition rather than recall** - Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

- **Flexibility and efficiency of use** - Accelerators – unseen by the novice user – may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

- **Aesthetic and minimalist design** - Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

- **Help users recognize, diagnose, and recover from errors** Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

7.3 The Prototype

The project resulted in a non-functional prototype that can be used by Normative when implementing new features. A group of features relating to the accounting-part of the platform were also fully implemented.

7.3.1 Non-functional prototype

The non-functional prototype evolved from the scenarios that we created in 6.3.2.1. This include some new features such as a way for companies to set sustainability goals, and a procurement planner that companies can use to compare different options for a procurement. Below follows a description of the designed views in the non-functional prototype.

As discussed in 7.1.1.1, one challenge is that the user group for products like Normative is very varied. We decided to design for a primary persona with expertise within sustainability and a high motivation to act sustainably. This has resulted in a design with a lot of features and flexibility, rather than a simpler tool with less features.

7.3.1.1 Accounting

The goal with the accounting view is for the user to be able to view and specify details about all the purchases that the company has made. This is shown in the list that can be seen in figure 7.2. In the figure, one transaction is expanded, so that the user can see what products that the Normative platform have guessed that the purchase contained. As discussed in 7.1.4.3, using specific product brands would give more accurate reports, but such information is currently not available. Rather, the products that the user can select are categories such as "organic banana" or "wind power".

In this view the user can also see a bar that shows how much of data that has been verified, seen in figure 7.2. This uses the self-monitoring strategy, described in 3.3.2.5 to encourage the user to verify data. To get the users to do manual work in order to get better sustainability reports can be challenging, as discussed in 7.1.5.1.
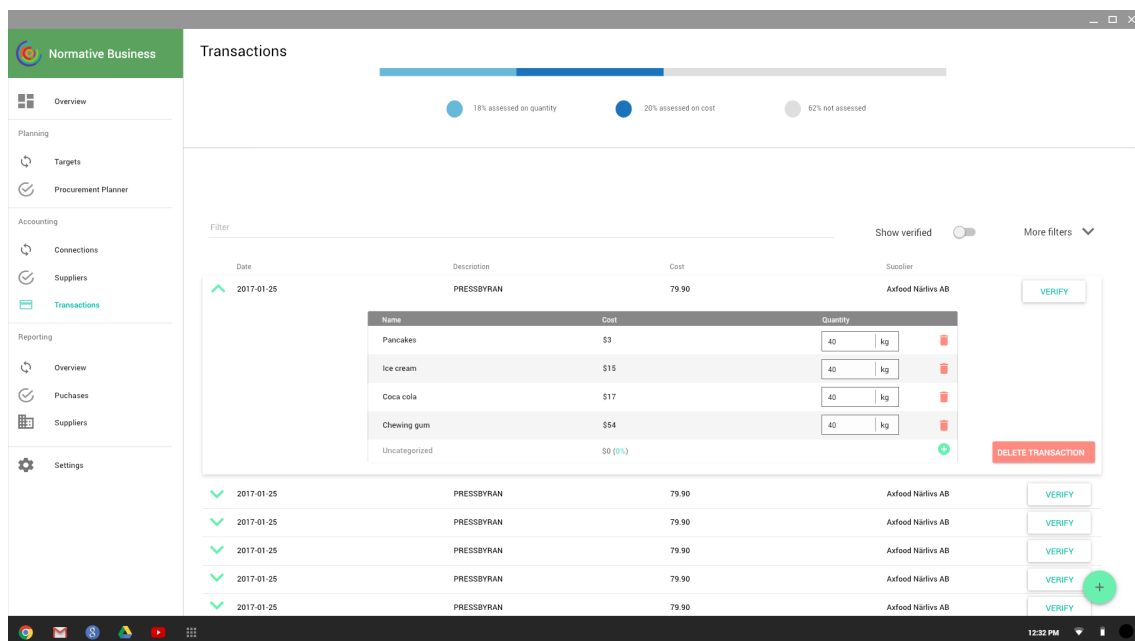
Figure 7.2: One transaction is expanded, showing its entries and editing functionalities.

Verify similar

As described in section 6.3.3.1, we created a feature to verify many similar transactions at once. The feature, as seen in figure 7.3 can be used to verify all transactions with the same name, or all transactions with both the same name and price.
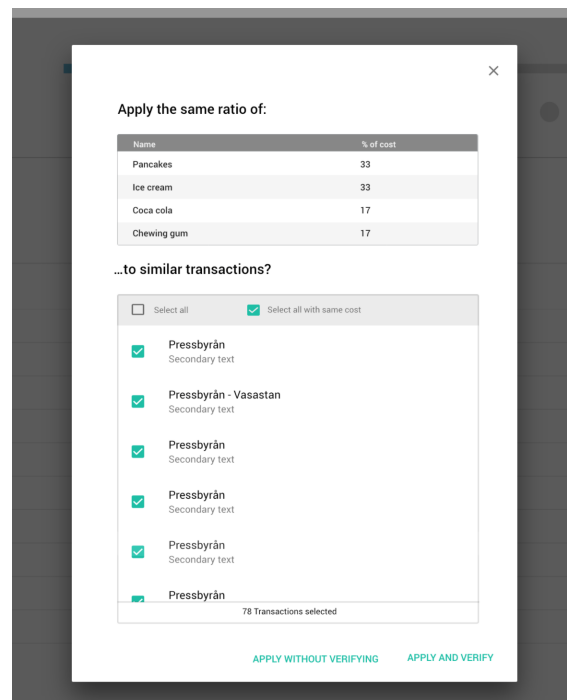
Figure 7.3: A dialog the lets the user verify many transactions at once.

7.3.1.2 Goals

As discussed in section 6.3.3, the goals feature help companies set and track their sustainability goals. As discussed in 7.1.5.4, tunneling can offer good persuasion, but flexibility is also sometimes needed. In this case, we made the goals as flexible as possible, even allowing companies to set goals to increase indicators that are considered "bad", such as CO_2 emission. This was needed to suit many different kinds of use cases, for example, a company might want to double in size, while "only" increasing their CO_2 emission by 20%. The final design for this feature, seen in figure 7.4, contains several features, including a guided way of setting new goals, letting the platform recommend a reasonable goal, based on a few factors. This feature can be seen in figure 7.5.

7.3.1.3 Suppliers

Adding a supplier to a transaction brings new possibilities to what the platform can inform the user of. Are the products from a specific region causing the company a lot of sustainability issues? Is a particular supplier the source for much of the climate change that the company is causing? Adding a supplier can help the platform give more accurate recommendations, and give the company better ability to act more sustainably. but the design for these recommendations is something we did not have time to explore. The feature can be seen in figure 7.6.
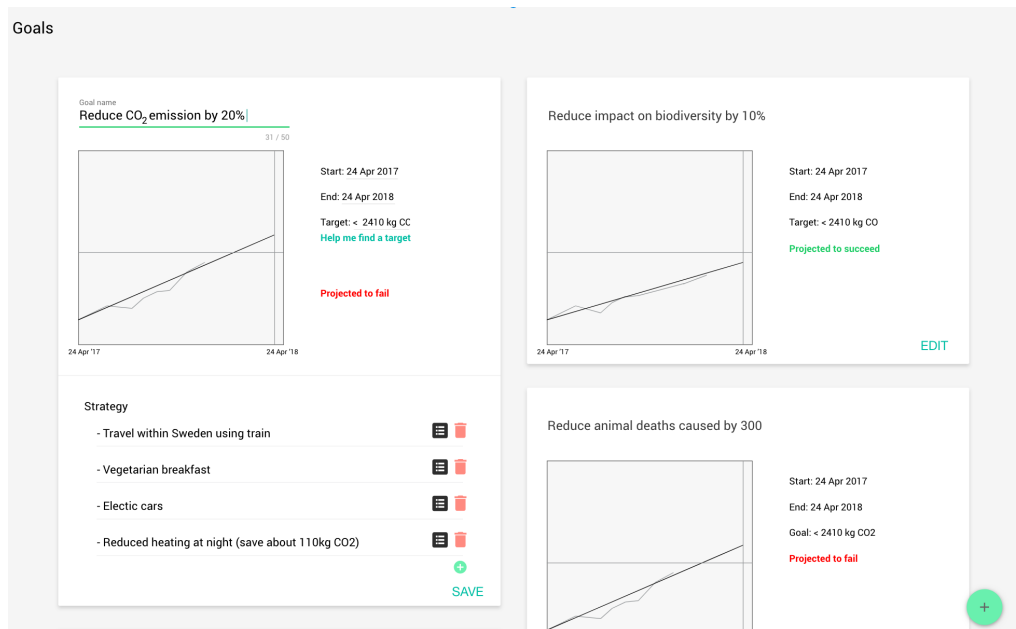
Figure 7.4: The goals view with one goal expanded.
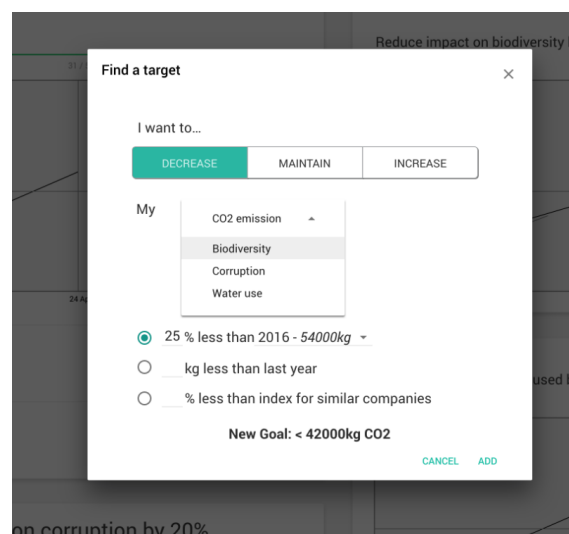
Figure 7.5: A guided way to set sustainability goals.
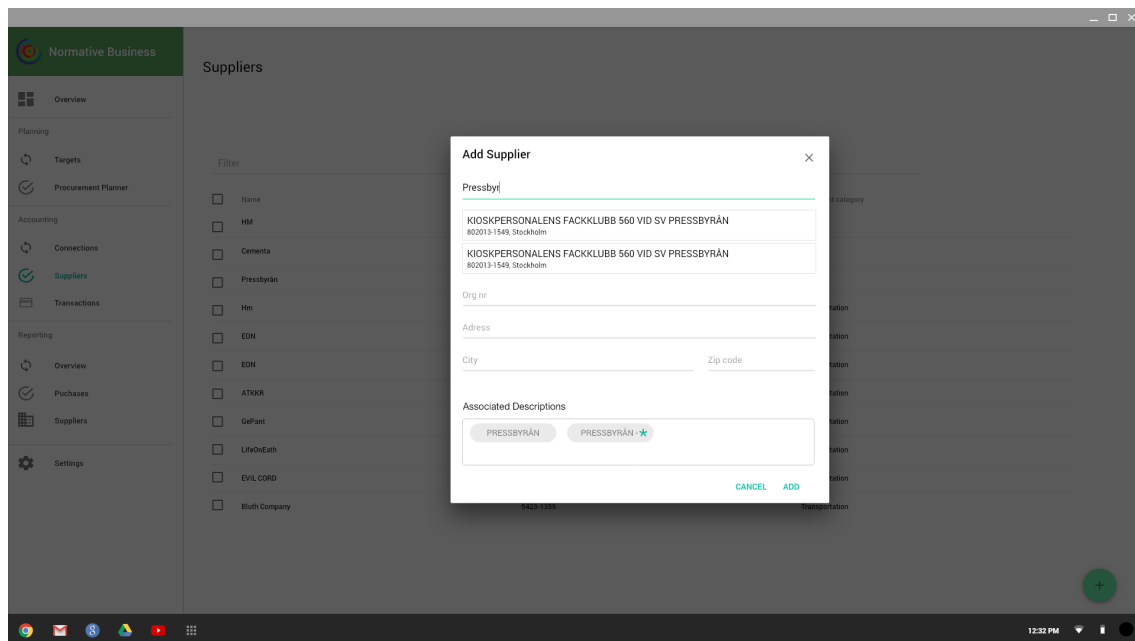
Figure 7.6: Add or edit a supplier.

7.3.1.4 Procurement planner

As described in 6.3.3.1, when creating the scenarios we realized that giving advice *before* a purchase is made is important in order to help companies become more sustainable. We created a feature to plan and compare different "baskets" of products, and to pick the basket that is more sustainable. As discussed in 7.1.5.2, deciding which option that is the most sustainable is very complicated, so we designed to tool be transparent, and the baskets to be possible to rank on all of the indicators. The feature can be seen in figure 7.7.

7.3.2 Implemented prototype

As mentioned in 6.4.1, we implemented the accounting feature. This was because it was a priority for the company, and we saw it as a core feature; the product can hardly be used without it. We implemented it in Angular 2, which gave us a lot better performance than the previous prototype implemented in AngularJS. The list of transactions is tested up to 10 000 transactions without lag, and with 100 000 transaction with 2-3 seconds delay. As discussed in 7.1.2.1, dealing with this large amount of data can be challenging for this types of products. The implemented version can be seen in figure 7.8. The verify-similar mentioned in 7.3.1 is also implemented according to the specifications, as well as a way to add and edit products categories from 10 000 different categories, seen in figure 7.9.
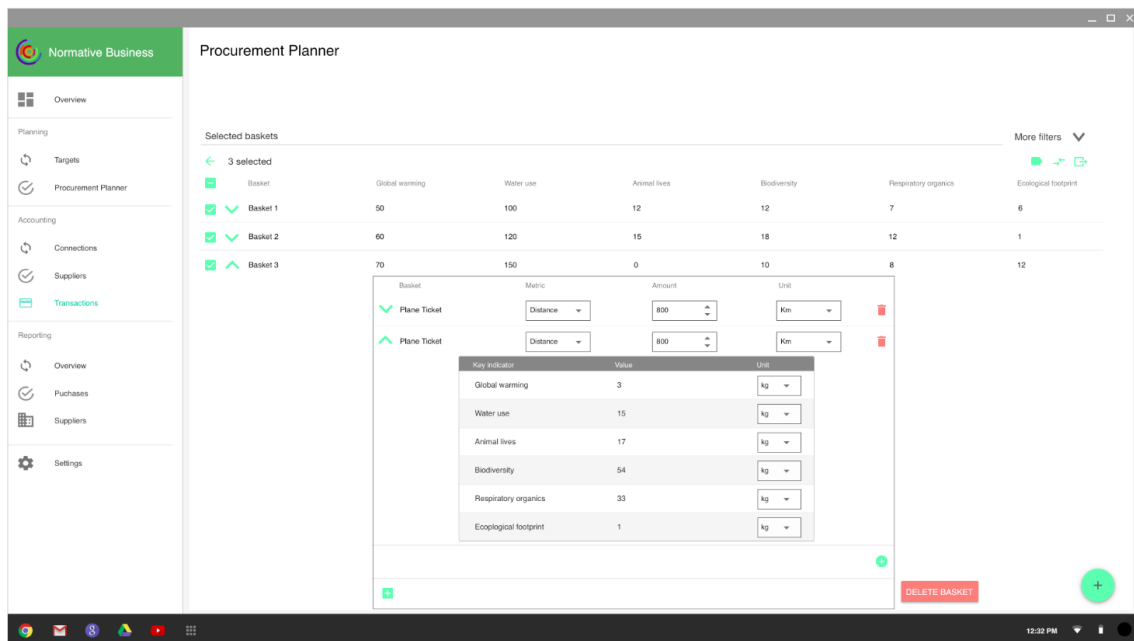
Figure 7.7: Hi-fi prototype of Procurement Planner.
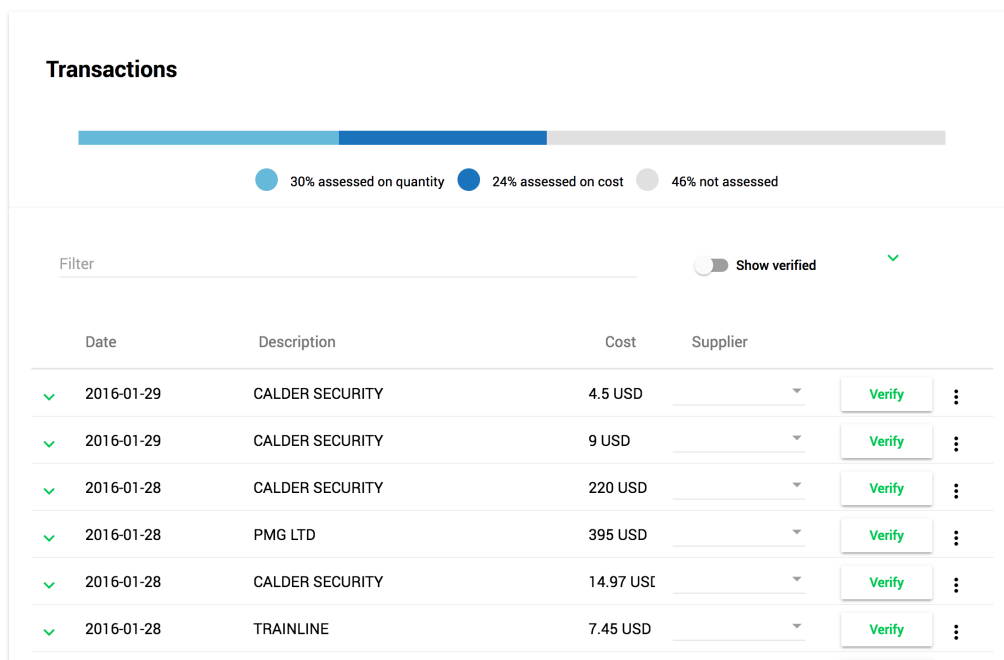
Figure 7.8: Implemented version of the accounting feature.
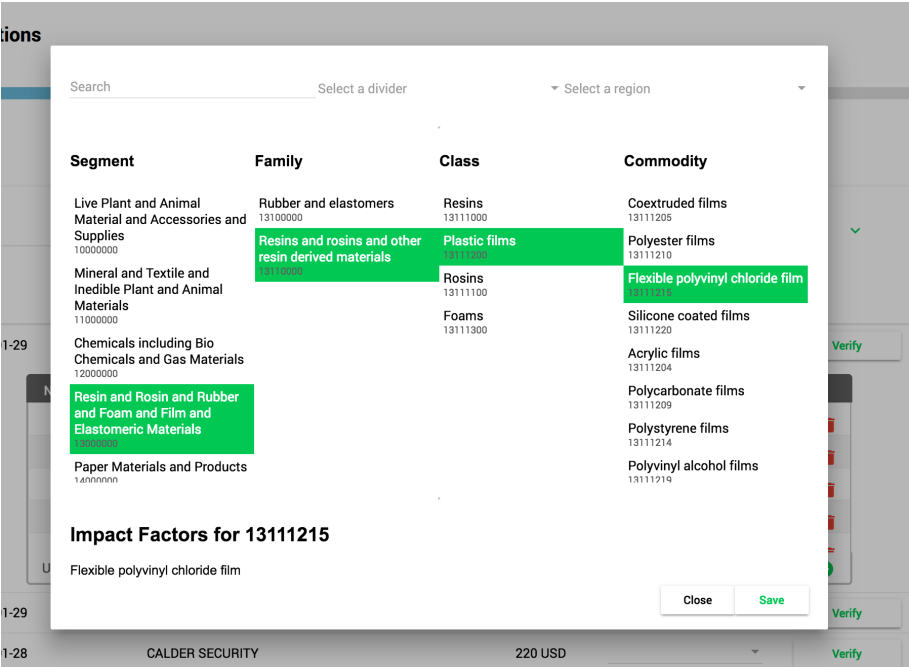
Figure 7.9: A dialog to change the product category.

8

Discussion

This chapter contains a discussion of the different aspects of the project. It starts with a discussion about the process, followed by a discussion about the results. The chapter ends with a discussion about ethical considerations for this type of research, as well as future work that we believe is needed in this research area.

8.1 Discussion about the process

During the different activities of this project we have learned a lot about how to conduct research. This section contains some discussions about the process.

8.1.1 Time and planning

This project has involved many different activities in a short period of time. We have conducted a literature review, interviews, two design iterations and implemented parts of the design. Thus each phase has been quite limited in time. In addition, we have designed many different features, which meant that we have spent less time on each than if we would have limited ourselves to less features, or had more time. As a result, we have designed several important features, but many of them would need further refinement before being implemented.

8.1.2 More interviews

We conducted a total of six interviews with potential users, as well as a few interviews with the people at Normative who could be considered both users and experts. During the last interview, we still learned a lot. The user group seemed to be very varied, and it was hard to get a grasp of it from just six interviews. We did manage to isolate a primary persona, someone that we wanted to design for. The primary persona was based on three of the interview subjects. If finding people at leading positions at big companies would have been easier, and if time would have allowed it, more interviews would have been useful. Specifically after our second iteration of design, when many detailed questions about sustainability reporting came up, another round of user research would have been fruitful.

8.1.3 Prototyping

A big part of the process has been spent prototyping on paper and in digital form. The digital prototype resembles a real product more than if we would have used only paper prototyping, however, it also forced us to spend a lot of time implementing details that might not be very interesting in relation to our research question, such as picking icons, colors and designing small interaction details. Interestingly, we found that some of these details could help persuade the user. For example, we believe that color can be used to guide the user towards a sustainable behaviour, as mentioned in 6.2.3.1.

8.2 Discussion about the result

This project has resulted in a set of challenges, a set of heurisics and a prototype, which were described in chapter 7. Here follows a discussion about these results.

8.2.1 Challenges

As mentioned in chapter 7, we identified several challenges related to creating services that help the users give advice to their organizations to make them more sustainable. Some originate from the fact that sustainability reporting in software is a new practice and others are more organization related.

As mentioned, many of the challenges are caused by the novelty of the practice. Since the domain of non-financial reporting is relatively new within companies there is a certain learning curve to the domain and lack of best practices on how to do the calculations. This means that the software in a way had to set standards for how to approach and explain the domain. It is not evident for the user how the transactions are linked to products which then are linked to environmental data. The paradox regarding this is to both make it easy to use but also explain all new concepts and how they work. This ties into our challenge regarding on whether to make the application more tunneling or flexibility oriented, described in 7.1.5.4. Since we considered our users professionals, we decided to gravitate more towards flexibility, thus giving them more freedom while making their decisions.

How companies operate varies a lot and is therefore hard to generalize into a common pattern. A common problem regarding this mentioned in the results is motivation. Since the ultimate motivation of companies often is profit, the sustainability awareness might be overshadowed. New regulations regarding sustainability can make sure that companies stays within sustainable limits. However, a recoil effect of introducing a law that only applies to larger companies, is that it might legitimize the smaller companies to not strive for better sustainability. If the law was not there they might still consider it, but now they have a valid excuse not to. The same goes for the companies which the laws apply to. They might make sure to stay within the legal limits, but after that they lose incitement to improve further.

Regarding the companies, we learned that people working directly with sustainability can be motivated as is and often do not need additional incitement from a software. However, for these companies it is important that the sustainability responsible is able to persuade the people in charge that actually establish sustainability changes. Because of this it is important that the software provides the tools to show and demonstrate the options in clear ways. This is why we consider it important to keep working on the sustainability reports generated by the system, making them graspable and easy to understand. A way to do this is to use graphs and other visual data that can be easier to understand than reports of texts or tables of data. This challenge is discussed in 7.1.6.2.

Regarding the lack of framework, mentioned in 7.1.1.4, the question is whether it is even possible to create a framework for persuasive design regarding companies, as opposed to for only individuals. Individuals are complex as they are and how they interact with each other in a company in conjunction with the goals of the company makes persuasion within a company even more complex. Perhaps it is not realistic to have a common framework for all companies, but rather sub frameworks for similar companies or focusing on the individuals within a company as was done in this report.

How to use the challenges

This thesis, and in particular the challenges that emerged from the design process, can help anyone involved in the creation of the kind of products that are described here. However, it is important to note that the challenges that we have identified are not exclusive. Rather, they could be seen as a starting point for others who want to explore this design space, and they need to be further investigated depending on the new context. For people creating similar products, it is important to conduct more user research, since our interviews do not provide a complete picture.

While the focus of this thesis has been on the creation of such products, some of the challenges can be solved in other ways than though design. For example, a challenge that we observed was that key people at companies might not be the users of the product, mentioned in 7.1.6.2. Instead they would just interact with it through the reports that were generated by it. This issue could also be resolved by better communication within the company, or simply to let people with more decision power use the product.

8.2.2 The prototype

This thesis has resulted in a non-functional prototype and part of the features implemented, described in 7.3. We have designed some new features, and the evaluation showed that in large it was possible to understand most concepts, but that some small details could steal focus from the user. We believe that one more iteration of design, using the list of issues identified from the evaluations as a starting point would be appropriate before the design is fully implemented.

8.3   Ethical considerations

A first question that must be asked considering ethical implications is whether or not it is morally right to design a product with the underlying purpose of changing the behaviour of the user. For a service like Normative, that persuades into becoming more sustainable, it might be tempting to say yes. However, we believe that regardless of purpose, it is essential for the service to be clear about what that purpose is. Therefore Normative should be clear about its intentions to help companies be more sustainable.

For a product that attempts to alter the behaviour of the user it is important to consider the ethical implications. If a platform like Normative is used by a large number of companies, the societal implication could be huge. For example, the indicators that Normative chooses to include in the platform could be given extra attention, while the indicators that are not included might even be given as little attention as for a user that do not use the product, or perhaps even less, because the company might be influenced by the software to value the indicators that are being measured.

A third issue is regarding the transparency of the data that is used in the service. Research is often founded by private parties with interest to influence its result. Therefore it is important for Normative to be transparent about the sources of the data, so that the users can make the judgment whether of not the data is biased or not.

8.4   Future Work

The challenges identified in chapter 7 serve as a starting point for many new questions. We view this project as an exploration of a previously largely untouched research area. The logical next steps for this topic is to evaluate if any changes in the target behaviour can be measured when using Normative. If the evaluations are successful, more features can be designed and implemented. Further user research should always guide the design of these features.

Evaluate if the target behaviour can be affected

This project has been conducted to explore a new design space and to find challenges within it. Our prototype can serve as an example of a product that could potentially affect the sustainability of the products that a company buys. As mentioned in 7.1.3.3, evaluating a persuasive product should be done over a longer period of time, ideally with many companies. While time did not allow us to conduct such an evaluation, we view it as an important next step within this research area.

Investigating how Normative should be used at a company

This thesis has focused on how products similar to Normative should be created. A related issue is the way these types of products should be introduced at companies. Which roles would be most suited to manage the application? What do the employees need to learn in order for the application to be successful at the company? These types of questions needs to be investigated for the platform to be successfully introduced at a company.

Design and implement new features

The problem regarding comparing different product brands is worth addressing since a typical use case is when a user has decided what to buy, but not from which brand. There could be great sustainability differences here to consider that currently are not taken into account by Normative. A way to bridge this gap could be, as described in 6.3.3, to let users add data of products with certain brands to Normative's collective database. This way the data set would grow as its user's add more product brands. It would however be necessary to introduce a way to validate the provided data so that it is reliable. A solution for this could be to crowd-source it, marking the data reliable if many people use it. Another way could be to have Normative receive the new data and verify it, which probably would not scale as well.

Research more roles at the company

It turns out that for very big companies, the person that use Normative's platform would often not have any decision power over what the company purchases. Therefore, the conversation we often had when designing was more about helping the user communicate the information they extract to other roles at the company. In future work, we believe that these roles should be more closely studied. What information do they need to make sustainable decisions? What priorities do they have?

9

Conclusion

This master thesis project has been undertaken to explore the design space of using persuasion in design to encourage companies to act more sustainable. The question we have attempted to answer was:

"*What challenges are involved in creating a service that persuades and informs a user - who works with sustainability reporting - to make calculated decisions in order to advise their organizations to become more sustainable?*"

To answer this question, we have conducted many activities, including the following:

- Interviews with experts in the field.

- Interviews with potential users.

- Literature research, reading about psychology, persuasive design and many other subjects.

- Formulating a set of heuristics to be able to evaluate the design.

- Designing a prototype of a product, Normative, that attempts to make companies more sustainable.

From these activities we have encountered areas that needs to be taken into consideration when designing products of this sorts, which we call challenges. These challenges are listed below.

Research challenges

- Varied User Group

- Hard to get hold of professionals working with non-financial reporting

- Understanding the Domain

- Lack of framework in persuasion regarding companies

Implementation challenges

- Displaying a lot of data without lag

Evaluation challenges

- Evaluating the platform's calculations

- Evaluating if the actual impact is measured correctly

- Evaluating the persuasive capabilities

Challenges with calculating environmental impact

- Gathering company data

- Finding environmental data

- Finding the impact of a specific product brands

- Legitimacy of different data sources

Persuasive design challenges

- Getting the companies to enter and verify data manually

- Comparing different indicators

- On-boarding

- Finding the balance between tunneling and flexibility

Organizational challenges

- Lack of external motivation

- Reaching key people at companies

Further work is needed to investigate each of these challenges further. Specifically there is a need to evaluate the possibility of influencing users within a company context using design. We encourage others to conduct more specific research into these topics.

We believe that Normative and this type of products can be used to enable companies that are motivated to become more sustainable, and contribute to a more sustainable future.

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A
Appendix: Interview Guide

- Intro

  - Berätta om produkten

  - Fråga vad dom vet

  - Berätta om oss

    * Chalmers IT + ID

- Hur jobbar/tänker ni med hållbarhet idag?

- Hur går ett inköp till hos er?

- Hur mycket vet ni om er miljöpåverkan?

- Terminologi

  - Vad skulle ni kalla faktorer som påverkar miljön/världen?

    * Impact factors

  - Hur ser kategorierna ut när ni bokför?

    * UNSPSC (Vet ni vad det är?)

- Demo - ca 15 minuter halvt guidad

B

Appendix: Provisional Personas

Karin, 37 år

Hållbarhetsansvarig på ABB
Civilingenjör i Kemiteknik från Chalmers universitet

Tycker om att resa, åka skidor, springa.
Karin bor tillsammans med sin fru Anki, som också jobbar på ABB som HR-ansvarig.
De har ett barn, Torkel, 3 år som går i Waldorf-förskola i närheten av deras arbete.

Karins tycker att det är viktigt att vara en bra kollega och en bra mamma. Hon vill gärna påverka sitt företag till att bli mer hållbart. Hon tycker om digitala verktyg så länge de känns moderna och lättanvända. Det är också viktigt att de är vetenskapliga och att beräkningarna sker på ett korrekt sätt.

Karin vill gärna ha en ledande position på ABB i framtiden, allra helst som VD där hon kan driva ABB till en global förebild inom hållbarhet.

Andrei Gabor, 28 år

Entreprenör på egna företaget SunBurn
Civilingenjör i Industriell ekonomi på Lunds universitet

Andrei älskar entreprenörskap. Han startade sitt tredje bolag, SunBurn, internettjänst för privatpersoner som vill investera solpaneler och sälja en del av elen som produceras. Idag har bolaget 15 anställda och har precis börjat gå med vinst.

Andrei tycker om att framstå som driven, etisk och social. Han tycker om att gå på meetups med andra entreprenörer. Han vill också gärna att hans företag på sikt ska göra honom förmögen, men det pratar han inte så mycket om. Han tycker om extremsport, men hinner sällan göra andra saker än att jobba sedan han startat SunBurn.

Även om SunBurn inte själva har så stora inköp, så tycker han att det är viktigt att de har koll på sin miljöpåverkan, för att bolaget som försöker uppmuntra andra att köpa solkraft, ska kännas trovärdigt.

Andreis mål:
- Framstå som framgångsrik

C

Appendix: Brainstorm

Brainstorming

General
- Make the filtering more understandable
- Change amount to cost
- Divide settings into 2 headings ("personal" and "app")
- The "mark all" button should be in the same place
- Indices to give companies something to compare to
- Compare impact with planetary boundaries
- Ambient displays to raise opinions
- Web widget
- Export planning lists as some format compatible with procurement software

Reduction
- Make a "verify all" button
- Make all lists infinite
- Easy-mode and Advanced-mode
  - Less shown complexity in Easy-mode
- Remove dashboard - Go to accounting
- Have shortcuts to important features in overview.

Tunnelling
- Sort planned purchases after percentual impact
- Tutorial/guide when using the app for the first time.
  - Positive reinforcements when finishing steps
- Let user know what types of products that have biggest impact
- Guide the user to achieve targets
- "Guide" the user into providing supplier info
- Let the user know what the "Next step" is
- Put the menus in the order that they are logically used by the user
- Wizard when adding a product to planning
  - Letting the user compare and see how sustainable the purchase is

Tailoring
- Customize the columns after what the company finds interesting

Suggestion

- Recommend to set a new target when a target is failed/succeeded.
- Make an "Optimize for sustainability"-button.
- When adding or planning a transaction there could be a warning if the transaction has a high impact
  - "This item is high in saturated fat"

Self monitoring

- Instant feedback when you add a product
- Show targets in nav-bar
- See how reports gets updated as the user adds a purchase.
- Progress bar
  - Max = target
  - Subgroups with sub bars of sub targets

Conditioning

- Color coded text when entering transactions that are Good or Bad
- Diploma is generated when a target is "reached"

X

D

Appendix: Personas

Personas

Leila Bergfeldt (Primary persona)

Leila Bergfeldt is 42 years old and works as Corporate Sustainability Officer, CSO, at ABB. She graduated the civil engineer programme with the orientation of chemistry.

A typical day, Leila talks to the managers and the different departments at ABB. One of her tasks is to give guidelines for the purchases done by other departments. This is done by taking part of questionnaires that potential partners fill in, and evaluate if these companies should be traded with or not. Right now, the company is developing new sustainability goals, which takes up a lot of her time. She is the key figure in this work. She also compiles information about the purchases done within the company and, with assistance from other departments such as the environmental department, she generates the data that the company's sustainability report should contain.

Leila likes the financial security that working as a manager at a big company gives her and her family. She also enjoys when she feels as if she is good at her job. Implementing a product that could cut costs and improve the sustainability work of ABB would be a good way of showing that she is in fact a good manager. Sustainability is important to her personally, but she understands that there are more aspects that need to be covered in order for ABB to be successful. She tries to balance her sustainable views while at the same time pleasing the company and its budget.

ABB is a multinational company and Leila is only CSO at the Swedish organisation. A lot of decisions that affect ABB in sweden happens on a global level. Sometimes she feels too tied up by the company's structure and that she cannot make as big impact as much as she wants to. Another limitation is the fact that customers of ABB is not always interested in the most sustainable option, but rather the cheapest.

Even if Leila gets detailed information from the Environment division and other divisions that she works with, she does feel that the information is lacking important aspects. She would like more detailed information about each product's production impact such as Scope 3.

Goals:
- ➢ Raise her own status at the company by implementing a successful environmental tool.
- ➢ Save money by reduced time spent on environmental calculations.
- ➢ Make her company more popular for their customers.
- ➢ Make their company more sustainable

- ❖ The behaviors themselves (activities and the motivations behind them)
  - ➢ Doesn't work with accounting
  - ➢ High interest in company growth
  - ➢ High level of education
  - ➢ Sustainability is somewhat motiviationing to them
  - ➢ Money and status motivates them
  - ➢ Average social skills
- ❖ The use environment(s)
  - ➢ Offices, meeting rooms, lounge areas
- ❖ Frustrations and pain points related to the behavior using current solutions
  - ➢ Too little information about the products production impact
  - ➢ Too tied up by the organisation and superiors; hard to make a change at the company.
  - ➢ Informal rules? Using social pressure rather than actual rules.
  - ➢ A need to appear sustainable to be credible.
- ❖ Demographics associated with the behavior.
  - ➢ 42
  - ➢ Highly educated
  - ➢ Family with children
  - ➢ High income
  - ➢ Female
- ❖ Skills, experience, or abilities relating to the behavior
  - ➢ Leaders
  - ➢ Pragmatic
  - ➢ Knowledge about their industry
- ❖ Attitudes and emotions associated with the behavior
  - ➢ Personal growth
  - ➢ Ambitious
  - ➢ Work-life balance
  - ➢ Afraid of being seen as not sustainable
- ❖ Relevant interactions with other people, products, or services
  - ➢ Lots of interaction with the leaders of the company
  - ➢
- ❖ Alternate or competing ways of doing the same thing, especially analog techniques
  - ➢ Not buying product were they don't know the origin
  - ➢ Social pressure
  - ➢ Wiki/Company guidelines
  - ➢ SAP and Excel

Stina Svensson (Secondary persona)

Stina is 30 years old and works as an economy assistant at the gym franchise Fitness24Seven. She is effective at her job and likes performing. However, she also finds it very important to socialize with her coworkers and treasures her time with them.

On a day to day basis she works with accounting for some of the gym's locations. She usually works by a desktop in the backoffice of a gym, but is also flexible and sometimes sits out in the cafeteria. She does not have too much power over all but finds a way to be flexible within her domain to make the most out of it. She has a slightly lower level of education and knowledge of economics compared to her coworkers working with economy. Stina however makes up for this by being a fast learner and quick adapter to the company's new softwares and technologies.

Stina does not care too much for the growth of the company as long as she can keep her job and get by.

- ❖ **Goals:**
    - ➢ Make a living
    - ➢ Be effective and good at her job
    - ➢ Be a good colleague
- ❖ The behaviors themselves (activities and the motivations behind them)
    - ➢ Works with accounting
    - ➢ Does not have a lot of power
    - ➢ Flexible in changing her ways
    - ➢ Not interested in company growth
    - ➢ Somewhat lower level of education
    - ➢ Average knowledge about economics
    - ➢ Money or status is not the main motivation that they work within their field
    - ➢ Above average technical skills
- ❖ The use environment(s)
    - ➢ Her company
    - ➢ Informal spaces
- ❖ Frustrations and pain points related to the behavior using current solutions
    - ➢ Lack of features
- ❖ Demographics associated with the behavior.
    - ➢ 30
    - ➢ Bachelor level education
- ❖ Skills, experience, or abilities relating to the behavior
    - ➢ Skilled using tools for accounting

- ➢ Open to new ideas
- ❖ Attitudes and emotions associated with the behavior.
    - ➢ Ambitious
- ❖ Relevant interactions with other people, products, or services
    - ➢ Interacts with accounting software
    - ➢ Managers and customers
- ❖ Alternate or competing ways of doing the same thing, especially analog techniques
    - ➢ Reading product information when possible

Simone Andersson (Secondary persona)

Simone Andersson is 25 year old designer that runs a small communication agency that works almost exclusively with companies that have sustainability or other ethical issues as their main focus area. She can't yet fully support herself from her company, but she does not wish to abandon her ideals and work with companies she does not agree with.

The main goal with her company is to be able to do what she loves without "selling out". This is sometimes hard as most companies' main drive is to make money, and she finds it hard to balance her ethical views with the monetary focus that is sometimes required when running a business. She would also likes to influence people that sees the campaigns she creates, thus make the world more aware of environmental and ethical issues. Simone has a lot of knowledge about environmental issues that comes from the internet and people that she talk to. There is no way for her to make calculations about every decision that she takes, so instead, she has some principles that she follow, such as buying organic, traveling using public transportation and to not eat meat.

Simone also needs to perform all the tasks that are involved in running a business. For this she has found a good automated tool that reduces the work of accounting and creating financial reports. She does not have the time or knowledge of using advanced, manual tools, and this let's her focus on her creative work.

Simone likes to network with companies in her city, especially with those that have an environmentally friendly profile. She is open to collaborations with other companies, and she believes that it could make her agency's solutions more interesting. Simone thinks that one future direction that her agency could take is a more data-driven approach, making environmental calculations that benchmarks different companies, and use the results for marketing. However, she does not have the tools to perform the calculations.

- ❖ **Goals:**
    - ➢ Make the world a better place
    - ➢ Maintain an ethical reputation
    - ➢ Make a living without "selling out"
- ❖ The behaviors themselves (activities and the motivations behind them)
    - ➢ Works with accounting
    - ➢ Does not have a lot of power
    - ➢ Flexible in changing their ways
    - ➢ Not interested in company growth
    - ➢ Somewhat lower level of education
    - ➢ Average knowledge about economics

- ➢ Money or status is not the main motivation that they work within their field
- ➢ Family has a lower priority as a motivation to work within their field
- ➢ Above average technical skills
- ❖ The use environment(s)
  - ➢ Smaller company
  - ➢ Informal spaces
- ❖ Frustrations and pain points related to the behavior using current solutions
  - ➢ Lack of features
- ❖ Demographics associated with the behavior.
  - ➢ 27
  - ➢ Bachelor level education
- ❖ Skills, experience, or abilities relating to the behavior
  - ➢ Skilled using tools for accounting
  - ➢ Open to new ideas
- ❖ Attitudes and emotions associated with the behavior.
  - ➢ Idealist
  - ➢ Ambitious
- ❖ Relevant interactions with other people, products, or services
  - ➢ Interacts with accounting software
  - ➢ Managers and customers
- ❖ Alternate or competing ways of doing the same thing, especially analog techniques
  - ➢ Reading product information when possible

Martin Turesson (Secondary persona)

Martin Turesson is 35 years old and graduated from Industrial engineering and management 6 years ago, and immediately started his own business. As for most, the first few attempts failed. The third company Martin started, Factor, was a success. Martin is now the CEO and founder of the Factor, a company that offers a billing service to small companies.

Martin spends his days meeting potential customers, investors and managing his 20 employees. As a manager, almost no day is like the other. There is always small issues that needs to be dealt with, and Martin feels as if his days are quickly getting consumed by meetings and phone calls.

Martin wants Factor to grow into a large business more than anything. He likes the money and status it brings, but he also enjoys entrepreneurship just for the fun in it. He doesn't know that much about sustainability, but he thinks that Factor should have a green profile for it to appear ethical to his customers. Defining environmental policies and making the calculations takes time and knowledge. So far the company has a wiki, a guide that the employees should follow. The wiki defines things like how the employee should choose their way of transportation. If the employees does not follow the wiki Martin could have a talk with them, but that doesn't happen very often. Sometimes the company avoids buying products that produced in other parts of the world, because knowing how it has been produced is too hard. Martin believes that some scandal involving him or the company working with companies with bad working conditions or similar would be bad for the business.

Martins main goal is to grow his grow his company.
- ◆ Goals
  - ➢ Make his company more popular for his customers.
  - ➢ Save time and money
  - ➢ Get more information about their company
  - ➢ Appear ethical and successful
- ❖ The behaviors themselves (activities and the motivations behind them)
  - ➢ Works with purchases sometimes
  - ➢ Interested in company growth
  - ➢ High level of education
  - ➢ Somewhat good knowledge about sustainability
  - ➢ Sustainability is not the biggest motivation for working within the domain
  - ➢ Money and status is an important motivational factor

- ➢ Not that good technical skills
- ➢ Has not that easy to learn new things
- ❖ The use environment(s)
  - ➢ Meetings rooms, office
- ❖ Frustrations and pain points related to the behavior using current solutions
  - ➢ Too little knowledge about products
  - ➢ Informal rules
- ❖ Demographics associated with the behavior.
  - ➢ 35
  - ➢ Highly educated
  - ➢ High income
- ❖ Skills, experience, or abilities relating to the behavior
  - ➢ Business experience/market knowledge
  - ➢ Like to talk a lot
- ❖ Attitudes and emotions associated with the behavior
  - ➢ Likes success
- ❖ Relevant interactions with other people, products, or services
  - ➢ Customer contact
  - ➢ Interacts with a lot of people within the industry
- ❖ Alternate or competing ways of doing the same thing, especially analog techniques
  - ➢ Avoid buying products with lesser known origin
  - ➢ Attempts to generate metrics of their environmental impact

E

Appendix: Context Scenarios

Context Scenarios

Target behaviour:

When the user decides between two products to purchase, they choose to purchase the more sustainable option more frequently than when not using the application.

- In what setting(s) will the product be used?
- Will it be used for extended amounts of time?
- Is the persona frequently interrupted?
- Do several people use a single workstation or device?
- With what other products will it be used?
- What primary activities does the persona need to perform to meet her goals?
- What is the expected end result of using the product?
- How much complexity is permissible, based on persona skill and frequency of use?

Martin Turesson

- ◆ Goals
    - ➢ Make his company more popular for his customers.
    - ➢ Save time and money
    - ➢ Get more information about their company
    - ➢ Appear ethical and successful

Scenario 1

1. Martin wants his company to appear more ethical to his customers. He orders a market research that concludes that the company needs to become more sustainable.
2. Martin opens Normative and looks over their sustainability goals. He creates a new strategy for the company where they should decrease their CO_2-emission and decrease their impact on biodiversity. He then immediately activates the strategy and sends an email to all of the employees, where he specifies that all journeys should be chosen with as much concern about the environment as possible.
3. He sends the strategy to the person responsible for the company's web page in which he writes that the strategy should be added to the company's web page. He also attaches two web-widgets that shows the company's CO_2-impact and impact on biodiversity.
4. The company's web pages gets updated and the public can view Factor's environmental impact.

Simone Andersson

- ❖ **Goals:**
    - ➢ Make the world a better place
    - ➢ Maintain an ethical reputation
    - ➢ Make a living without "selling out"

Scenario 1
1. Simone gets in contact with a manager of a company that wishes to show their environmental work.
2. Simone works out a new part of their homepage that displays company's sustainability goals.
3. To add credibility, she connects the company's accounting software to Normative, and reviews their automatically generated impact.
4. She selects a few, and generates a html-widget that displays the impact together with a comparison to index for companies of that size.
5. She adds the widgets to the new part of the company's web page.

Stina
❖ **Goals:**
  ➢ Make a living
  ➢ Be effective and good at her job
  ➢ Be a good colleague

Scenario 1
1. Stina's boss tells her to look over the company for the last quarter and to give a report of the environmental impact it has had. Specifically, he wants Stina to give him a pdf with a clear overview of the company's impact on CO_2, biodiversity and water consumption over the past 3 months.
2. Stina opens the Normative software. It is already connected to the company's bank from which the transactions are retrieved.
3. Stina starts going over the list of transactions. She checks that everything looks good.
4. Stina then generates a report as a pdf for the last three months, showing CO_2-emissions, water use and biodiversity. She selects the last 3 months as the time period.
5. Stina sends the report to her manager.
6. After a week, Stinas manager tells her that after viewing the report, the board has decided that the company has a few new sustainability goals, that he wants her to add to Normative.
7. Stina gets a list of goals that the board has decided. They include:
   a. Decreased CO_2-emission by 20%
   b. Decreased water usage by 20%
   c. A smaller impact on biodiversity by 5%
8. Stina creates a new strategy in Normative with the goals she got from her manager.
9. During the year, Stina gets a request to report about how the goals are progressing and what the projected outcomes will be. Stina gives them a link that shows an updated view of the company's goals.

Leila

❖ **Goals:**
  ➢ Raise her own status at the company by implementing a successful environmental tool.
  ➢ Save money by reduced time spent on environmental calculations.
  ➢ Make her company more popular for their customers.
  ➢ Make their company more sustainable

Scenario 1

1. Leila gets an email from the purchasing department were she is asked to give feedback on a few suppliers. The engineering department has requested to buy supplies for a new robotic arm.
2. Leila checks Normative to see if the companies have agreed to ABB's code of conduct. One of the suppliers, Evil Corp, have not, so she orders the app to send them a message requesting that the sign the code of conduct.
3. Leila then creates a shopping basket of items needed for the arm, and compares what environmental impact it would have when bought by the different companies. She sees that three of the suppliers, (Evil Corp, Hooli, Vandelay Industries) would have a projected success on their environmental goals. Since Evil Corp has not yet signed the code of conduct she decides to wait one day with the decision.
4. The next day Evil Corp has not answered the request, so Leila decides to exclude it from consideration.
5. Hooli has the lowest impact on most metrics, but Vandelay has a much lower cost, so she decides to recommend both to the purchasing department. She emphasize that the difference in impact is not that big.
6. The purchasing department decides to buy from Vandelay, and as soon as the order is registered in the accounting software, the order appears in Normative. Leila can see the order, and that many data points, such as carbon emission has increased. The company's environmental goals are still projected to succeed.

Scenario 2

Finalize Accounting -> Reporting

1. Leila is preparing for a meeting with the managers of ABB to set new sustainability goals. She reviews the impact that the company had last year, and compares some of the metrics with an index for companies of that size.
2. She identifies that ABB's carbon emission seems very high compared to index, and clicks to see more info about their causes.
3. Normative lists all the companies and product categories that contribute to their carbon emission. Production is the highest, but Leila knows from experience that production

impact is slow to change, so she focuses her attention on number two, flights taken by company employees instead.

4. She views the details of flights, and realizes that flights within Sweden is a large part of the emissions. She decides that a new strategy to bring down ABB's carbon emissions could be to replace a lot of the domestic flights with trains.
5. Leila enters the planning part of Normative, and starts comparing the emission of different shopping baskets of travels that are typical at ABB. She lets Normative calculate the carbon emission savings that could be made by using another option than flights.
6. Leila keeps comparing some different product categories and suppliers (other than flights) and finds some additional rooms for improvement. With the planning tool she calculates the environmental savings that ABB can make.
7. Leila adds the different savings to the environmental goals of ABB. The target values of different impact points gets updated along with a description for each action that needs to be taken for them to success.
8. Leila brings the generated strategy to a meeting with the managers at ABB. The managers approves of it and Leila activates them in Normative.

Scenario 3
Backing up a decision

1. An executive runs into Leila's office and asks her why they decided to buy the much more expensive vehicle tracks from JustACompany instead of the cheaper ones from WhateverCompany.
2. She asks from when the purchase was made on which he replies last year.
3. Leila opens up the Normative app and enters the menu *Comparisons*.
4. She finds in the list the comparisons between JustACompany and WhateverCompany from the time given and opens it.
5. The executives now sees the data connected to the baskets of each company and why JustACompany was chosen.

F
Appendix: Think-Aloud Evaluation

Think-aloud evaluation

Goals
1. Check goals
2. View details
3. Edit a goal
4. Add a new strategy point
5. Edit goal using the help
6. Save the goal
7. Create a new goal using help-wizard
8. Create a new goal manually

Procurement planner
1. Compare three baskets
2. Order the baskets according to a certain metric
3. Edit a basket.
4. Check the values of the items in the basket
5. Create a tag for a basket
6. Check the key indicators of an item in the basket
7. Create a new basket *Ej implementerat*
8. Create a tag for mutliple baskets
9. Export the comparison between a selected set of baskets

Transactions
1. Visa transactions
2. Visa alla transactions - även de som redan är verifyade
3. Kolla att innehållet i den översta transaktionen stämmer
4. Verifiera om det ser bra ut
5. Välj att alla liknande
6. Applicera ratiot och verifiera
7. Hitta transaktioner som kostar mellan 20 dollar och 100 dollar från förra året

Suppliers
1. Visa suppliers
2. Lägg till en ny supplier